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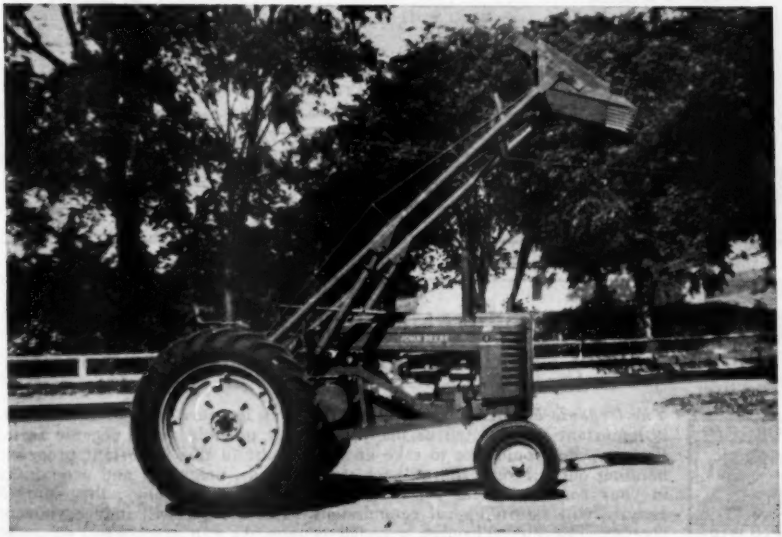

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VOL. 1, NUMBER 3 OCTOBER, 1949

THE ORGANIC FARMER

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From Readers . . . .

Sesame Seeds Don't Mix With Poultry Droppings

Dear Sir:

In 1936 I did research and wrote quite a number of bulletins on various topics relating to the subject of foreign trade at the port of Los Angeles. One such topic was "sesame seeds." Most of our imports of the seed came from China. Then the experiment station at Davis grew some experimentally—even sent me a few pounds—and worked out a method for growing them in California with the help of machinery. Farmers in some of the southern districts, especially the Imperial Valley, planned to grow them commercially.

Then our Department of Commerce shook the wires to China and induced the Chinese farmers to get in on the opportunity. The poor chaps loaded a ship with sesame seeds swept up from their poultry pastures. When it arrived at this port the inspectors ordered it all dumped in the Pacific. After that our officials organized an expedition to China to teach the farmers there how to prepare the seeds (by sweeping the poultry droppings out) before they shipped them to this country.

They succeeded so well that our California farmers could not meet the competition and another bright idea just died a-borning.

Stuart H. Whitten,
Hollywood, California.

Tobacco Stems Make Good Mulches

Dear Sir:

I live in Kentucky in the tobacco belt and I am able to get a lot of tobacco stalks. I have been using all of them in my compost pile. Most farmers tell me that it is best to spread the stalks on top of the ground and let the contents become absorbed in the ground.

Which method do you advise?

Ben Rosen,
Winchester, Ky.

Ed. Mulching is a good way to condition soil. If you spread your tobacco stems on top of the soil, disk them in to hasten decomposition.

The Fly Problem

Dear Sir:

I am interested in knowing how to eliminate the fly problem around barns, packing houses, etc. Since you don't recommend DDT and other poisonous sprays, can you recommend other, non-poisonous sprays, or perhaps some other method of reducing this pest.

Walter W. Reinke,
Fremont, Michigan

Ed. DDT and other powerful insecticides should definitely not be used. DDT is now turning up in milk because of its use in dairy barns and parathion has recently killed several farmers who were using it. Theoretically, the best way to curb flies would be to prevent their eggs from hatching. Manure would have to be cleaned up every day and put in protective shelters or composted in order to do this. Some of the milder sprays like Flit might help to reduce the fly population. Electric traps are also safe.

The Organic Method In The Orchard

Dear Sir:

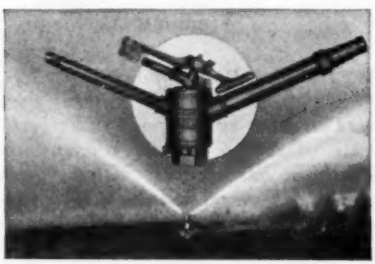
Your new magazine has proven very interesting and I am certain that I

shall gain a great deal of valuable assistance from it. Congratulations and continued success with it.

I am starting a forty acre orchard (peaches, cherries and apples) on virgin land and I will irrigate with a portable irrigation system. I anticipate not using non-organic fertilizers, but am troubled by a lack of manure. What do you suggest?

Ed. The ring method of compost making is the best way to treat an orchard organically. Instead of making your compost in heaps outside the orchard, apply the raw materials in a ring around each tree. Start about three feet away from the trunk and continue to the drip line. Build up the layers until you have a pile two feet high.

Since you have little manure you will have to gather quantities of residue green matter, such as leaves, corn cobs, spoiled hay and even tree prunings. The animal matter can be furnished by cultivated earthworms which should be put in the compost to hasten decomposition.



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An Organic Pasture

Dear Sir:

I have a two acre field that I can afford to use to experiment with the Organic Method. My farmer planted barley in the field last fall. The crop has been harvested, but the field has not been tilled. Would you advise me how I can handle this field so that I can get it into an organic one as soon as possible. Eventually I would like the field to end up as a pasture. This field has been pastured for the last few years and has been top dressed with manure and superphosphate. It has also had some 3-12-6 fertilizer on it.

Alice A. Morris,
Chestertown, Maryland

Ed. Since your field is now bare, it is important that you get it covered before winter. Sow a cover crop of 20 pounds of domestic rye grass and 10 pounds of winter vetch seed per acre. In the spring, plow under the cover crop and plant soy beans, a good soil improver. At about the end of July, spread manure, lime phosphate rock and any residual organic matter you may have on top of the soy beans and disk them in. You will then be making compost right on your field.

Grinding Corn Cobs Hastens Decay

Dear Sir:

I would like to get your opinion on the use of ground corn cobs. I have in mind grinding the cobs so that the pieces are 3/8 inches in diameter. I understand that they can be put directly on the soil and turned under in the spring. My soil is very sandy and has almost no organic matter in it, so you can see why I am so intent on using the Organic Method.

I have in mind starting a compost pile with cobs and leaves and manure to use on the garden next spring. I have quite a few leaves available.

Don Hentsox,
Bristol, Ind.

Ed. Ground corn cobs will make an excellent source of organic matter for your soil. On our experimental farm we allow the cobs to lay in piles for a short time to become weathered before grinding them. Then they become almost pulverized as they are run through an ensilage cutter.

You will do well by composting the corn cobs and leaves together. The leaves need something mixed with them to supply air spaces. Otherwise they will not decompose in the compost heap. They can be ground just like the corn cobs.

Mulches

Yields from cherry trees have been increased 100 percent in experiments at Michigan State College. It was done by mulching the trees with straw or legume hay, in tests by Dr. A. L. Kenworthy, horticulturist. The increase came on trees receiving only mulch and no fertilizer, as compared with trees which received complete fertilizer but no mulch.

More and more people are awakening to the great value of mulches. Recently, a New England farmer, hard put for an orchard area, who cleared a heavily wooded hillside and, finding no place for disposal of the brush, piled it around his young trees, right up to the tops. It rotted down, smothered out weeds, held moisture and added plant food. The growth from these trees and yield during their early years was amazingly greater than those handled in the usual way.

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ORGANIC GARDENING
Dept. OF-10G, Emmaus, Pa.

Good Soil Means Good Teeth

By J. P. MAXWELL

Reprinted from The Lion's Magazine

IN THE little town of Arcadia in northwest Lousiana Dr. D. Shehee has been practising dentistry for 37 years. In that time he has naturally seen a lot of teeth. He has taken care of the teeth of three generations in many a family in the farm area around Arcadia. He has compared the teeth of the three generations and has found that the grandfolks were far better off than their grandchildren. He attributes this general decline in the soundness of teeth mainly to eroded and depleted soil, to soil so deficient in minerals and vitamins that the food it produces also lacks these health-giving elements.

Where there has been a marked decline in the teeth of the three generations, the soil of the farms on which the families have lived has also declined in fertility and productiveness through erosion and depletion. Where the farm land has not been subject to serious erosion or where the soil fertility has been maintained through conservation measures, there has been some deterioration in the teeth of the three generations but the decline has not been so marked or serious as in the case of those whose soil has suffered from erosion and depletion. Dr. Shehee has checked the farms to confirm his office observations.

"The current generation living on good soil have teeth better than those of the same generation living on eroded soil but not so good as the

teeth of their grandparents," Dr. Shehee said. "When the soil has not been eroded or depleted, the decline in teeth can be attributed largely to the highly refined foods eaten by people today, foods so thoroughly refined for appearance sake that the wholesome elements are practically processed out of them, like fluffy flour, golden cane syrup and polished rice."

Dr. Shehee points out that there are other factors involved, such as proper care of the teeth, including oral hygiene, and the complex physiological process of assimilation. But basically, he asserts, poor teeth are caused by poor soil.

"It's a pity to see a young child with a mouthful of bad teeth," Dr. Shehee commented. "Just the other day a mother brought her three-year-old son to me. He didn't have a sound tooth—every single tooth was abscessed. His parents had fairly good teeth, his grandparents had excellent teeth. It was the same story. I knew the land that family has lived on. It has declined with each generation.

"We're going to have to change some of our old concepts drastically. For example there's no truth in the slogan that a 'clean tooth never decays.' The current generation who come to my office have in the main had excellent care. They are taught the importance of oral hygiene all through their school days. That is quite necessary. What also is necessary now is to teach them and their parents something about food and the soil means good teeth GAL. 2 O.F. soil that produces it. Farmers themselves must make full use of natural manure and learn more about commercial fertilizers before using them.

"It is not so much the kind and quantity of food that we eat but the quality that counts. The content of the food is the important thing. So long as food is grown on eroded and impoverished soil, so long will it be deficient in minerals and vitamins. And as long as people eat food grown on sick soil, they will have bad teeth."

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ORGANIC FARMER, Dept. OF10D, EMMAUS, PA.

Editorial

AT THIS time it would be a good thing to discuss the best way that the organic method could be applied to farming. In the past few months new developments of a revolutionary nature have occurred so that it is especially important that the whole matter be reopened and analyzed. Many agriculturists have contemptuously referred to the organic method as the pitch-fork method of farming. It *was* that at the beginning but we have progressed considerably since then.

Sir Albert Howard, who died a few years ago, was the father and developer of the organic method of farming and gardening. He had a background of experience with it of over thirty years. He proved conclusively that it could give higher yields and healthier foods. I had the personal pleasure of introducing his method officially into the United States as his direct representative. We now have about seven years of experience with it. We and many others have found it good.

In the first place, the concentrated chemical fertilizers should never be used either in farming or gardening. See my article *Why Chemical Fertilizers are Bad,* which appears elsewhere in this issue. Secondly, we greatly encourage the use of green manure or cover crops. But such green crops are not sufficient to fertilize the land, if crops are going to be taken off it each year. We must add something. If that is so, then what kind of fertilizers are we going to use?

We are told that growing plants need mainly nitrogen, phosphorus and potash, so we are going to review what our attitude is toward these three elements.

Nitrogen

Besides synthetic nitrogen, which we do not recommend, the only place you will find nitrogen is in the air and in living matter such as plants, manure, etc. If you plant a leguminous crop such as clover or alfalfa and plow it under, your land will become greatly enriched with nitrogen. By applying organic matter to the soil in the form of animal manure you will get some nitrogen. Another method would be to purchase organic materials that are rich in nitrogen such as cottonseed meal, castor pomace, slaughterhouse tankage, dried blood, etc. Our booklet (price 50c) called *Manual of Organic Materials* is helpful in describing the contents of various kinds of organic materials. Check with your regular fertilizer dealer for a supply of some of these materials. Otherwise, contact your county agent.

You can get additional nitrogen by applying mulches to your land, of weeds, leaves, grass clippings, spoiled hay, chaff, roadside trimmings, etc. They do not contain too much nitrogen but they have the effect, by decaying, of multiplying certain soil bacteria called azotobacter that can fix nitrogen from the air. In a soil well enriched with organic matter the population of azotobacter can become so great that the amounts of nitrogen they can fix becomes extremely significant.

Phosphorus

Instead of using superphosphate for our phosphorus we use the raw finely ground phosphate rock which

is much cheaper and does not contain the harmful sulphur. An article on phosphate rock is printed elsewhere in this issue.

Potash

We advise going easy when it comes to potash because in excess potash can do harm. It creates an oversupply of cellulose and carbohydrate, and a reduction of protein. In France certain physicians inferred that the incidence of cancer and the amount of potash in the soil were related. Only in the last year or two have we become aware that safe types of potash can be purchased.

In chemical fertilizers the potash is put into action with muriatic acid, giving muriate of potash. It is the acid that we object to. Now, if we could find a source of plain potash, it would serve our purpose much better. And recently we have found two sources. One is a substance called *glauconite* used in water softening. Glauconite is a rock that has potash as one of its ingredients. By grinding it finely it becomes a safe source of potash for the growing crop. Some of it will be immediately available. Another source of potash is a rock called feldspar which, in a finely ground form, is used in the ceramic industry to make glazes. Both of these materials will soon be advertised in this magazine. This country has billions of tons of various kinds of rocks which if ground up would make wonderful, mild, safe fertilizers. The granite rocks usually contain some potash. I would not use over three or four hundred pounds of potash rock per acre.

In many regions there are companies owning granite quarries that grind it to make grit for chickens. Check with them. Here you have a nearby source of ground rocks, many of which contain potash. You will not have to pay too much freight.

Thus far, therefore, in comparing the organic with the chemical method we see that we are not too far apart. We have phosphorus and potash at a lower price and nitrogen practically free of cost. Our type of phosphorus and potash can be spread with the same type of equipment as used by the chemical farmer. We also use green manure crops for additional organic matter.

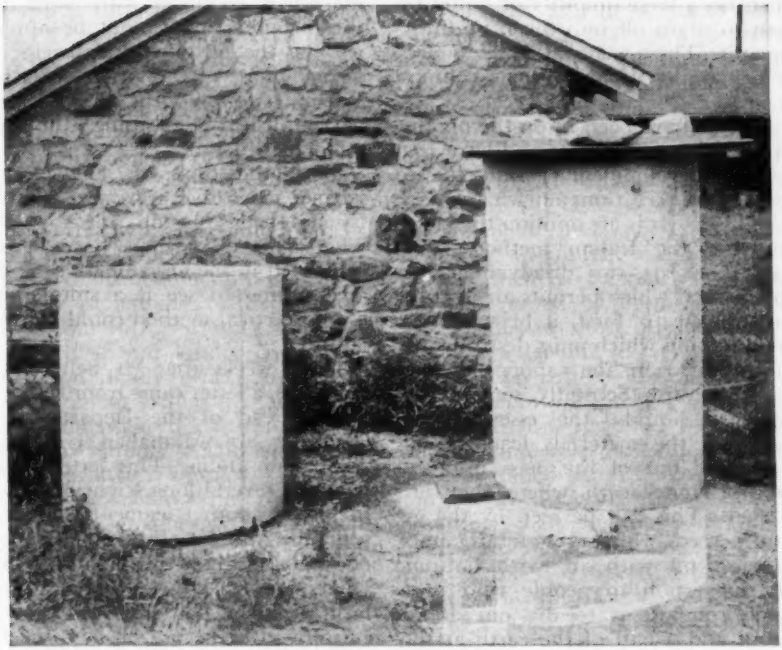
Do we *have* to make compost?

I can see where most farming can be conducted without making compost. The decision will be up to the individual. On small farms there may be a place for compost-making, but on larger acreage, probably not. We are now coming into the second phase of ORGANICULTURE, which appears to be a much cheaper method of farming. It will be characterized by higher crop yields, also containing higher quantity and quality of nutrients.

Now here are the facts which were instrumental in leading up to the second phase. About a year ago a Mr. Charles Selvi, who was an agricultural inspector for the Italian Government and who in that work made some interesting discoveries about composting manure, contacted me. As a result he worked for The Soil and Health Foundation for about two months. In Italy more than ten years ago he was instrumental in developing a new method for aging manure.

In the Valcanale region of Italy, a summer-resort and farming country, the city tourists complained of the noxious smells of the manure from the farms, which they claimed was spoiling their vacations. The Government detailed Mr. Selvi to go there and see what he could do about it. He suggested that instead of leaving the manure heaped up in piles it be placed in covered pits. After studying the matter carefully he learned a few tricks. He found that if the pit had a cement bottom slanted toward a smaller special drainage pit outside of the confines of the main pit, so that the liquids could drain off into it, a better fermentation would take place.

He found that if the main pit was covered with tight doors to keep the



Left, compost being made by the "old method". Right, a compost silo designed by Mr. Selvi. Skeletonized drawing shows underground structure.

air out, a better fermentation would take place. In other words, Mr. Selvi's process was an anaerobic one, accomplished without air. It was also important to keep the rainwaters out. The finished, fermented manure was found to be a wonderful product with much higher quantities of nitrogen, phosphorus and potash than the manure piled up in heaps exposed to the air. When it was applied to the fields the results were amazing. The crops were much finer and heavier in yields.

Now we were taught that to make compost we must prevent putrefaction by permitting the composting materials to be open to the air. In fact we had to make aeration holes in the material with a crow-bar. We were told that if we did not do so, if there was a lack of air, the undesirable putrefactive anaerobic bacteria would take over and spoil the compost.

To check on Mr. Selvi's method, we constructed a special pit with a cement bottom leading to a little outside pit for the draining off of the liquids. (See photograph) We made sure to tightly cover the top so that no air could enter. Next to it we made a similar pit with an earth bottom and no cover. We filled both with steer manure. At the time of writing, almost two months after the two pits were filled, we were surprised to find that the manure in the Selvi enclosed silo smelled less than that in the pit open to the air. The observation was made by Dr. Ehrenfried Pfeiffer, Dr. Wm. H. Eyster and myself. This is amazing since all the published literature claims that under such conditions there would be putrefaction and smells. Instead we find an orderly process of decay. The thing that struck me was that from the very

first day a large quantity of liquid began to drain off into the little drainage pit. These were valuable essences, which are lost in an ordinary compost heap.

Since I have been in on the organic method for a long time and have seen its slow development I would like to give my observations on what I have seen so far. It is my opinion that since studying the Italian method I see that there are two disadvantages in the method which permits air to come into the heap. First, it brings about an oxidation which must destroy some of the nitrogen, the vapors of which waste upward. Secondly, some of the valuable liquids, the essences, the juices of the materials leach downward and out of the mass into the ground underneath where they are wasted. This can be seen by the gigantic weeds which grow in an empty compost pit with an earth bottom. My suggestion to people who have made compost is to dig out about a foot and a half of the earth at the base of the heap and apply this rich earth to their vegetable gardens or to the new compost heap.

The Selvi method, by covering the top and the bottom, keeps everything in the mass. What is required now is a study of the chemistry and the microbiology of this new process so that we may become acquainted with the exact savings of plant nutrients. From what I have seen, I am thoroughly convinced that the new method is a great improvement over the old. One of its advantages is that there is very little heat generated and thus there is not a combusting out of weight or volume. The finished compost weighs much more, and takes up much more room, than an equivalent amount made by the present method.

Sheet Composting

Sir Albert Howard suggested two methods. One, the making of compost heaps. Two, sheet composting. I believe that the sheet composting method, combined with the Selvi process when conditions are such that sheet composting cannot be applied, will be the farming practice for the second phase of the Organic Method. Within a few months a booklet will be published describing the Selvi method in detail.

Since the start of The Organic Farmer magazine, a great responsibility has been put on our shoulders. Thousands of farmers have become interested in the Organic Method, but are waiting to see if a simpler and more practical method could be worked out.

A few weeks after Mr, Selvi left, as if by fate, a letter came from Dr. N. R. Dhar, Head of the Department of Chemistry, of Allahabad University, Allahabad, India. This letter, which included several long scientific papers, furnished another segment in the rapidly filling jig-saw of the organic method. Between these two men—Selvi and Dhar, I see a system by which any farm of whatever size can dispense entirely with the use of chemical fertilizers and operate under the organic method.

First let me give you a copy of the letter sent to me by Dr. N. R. Dhar:

24th June 1949

Dear Mr. Rodale,

I have read with great interest your book *Pay Dirt*.

For a number of years I have carried on research work on the problem of nitrogen fixation. I have shown that when energy materials like carbohydrates, fats, cellulose, glycerol, organic acids and their salts, are mixed with soil or sand, or oxides of aluminum, iron, etc., the energy materials undergo slow oxidation and in this process the nitrogen of the air is fixed. When this system is illuminated by sun light or artificial light more nitrogen is fixed. We have repeatedly observed that this phenomenon can take place under completely sterile conditions. We have been able to establish that in nitrogen fixation neither soil nor micro-organisms are needed. What is wanted is an energy material in con-

tact with a surface to which air has access. This reaction can take place at the ordinary temperature, and I believe that this reaction is the chief source of the nitrogen in soil. As you are deeply interested in the problem of the utilization of sun light I shall be grateful if you kindly take up some work on this important subject. It will be certainly worth while if workers in photosynthesis are also interested in this phenomenon in which sun light is actually utilized in increasing the nitrogen stock. I shall be obliged if you kindly try to get workers on photosynthesis interested in this problem so that they may take up experimental work in this line. I shall gladly supply details about the technique which is simple.

As you are keen on the preparation of composts I request you to use all types of waste energy materials for manure in your fields, i.e. add the organic matter direct to the soil, and allow the composting to take place in the fields as is actually taking place under natural conditions. The only point is that after the addition of the organic materials you have to wait for 2-3 months depending on the amount of the material added and then you can sow your crop. This time factor is needed because the phenomenon of the oxidation of carbon of the energy material takes time and thus in this time nitrogen fixation takes place. In composting the aim is to preserve the nitrogenous matter present in the organic substance and add it to the soil with 10 times its weight of carbon and the minerals. In my method you not only add the nitrogen present in the material but also add additional nitrogen which is fixed from the energy of the oxidation of the carbonaceous substance and light absorption.

In a separate cover I am sending you some of my published papers on the subject.

Yours sincerely,
(signed) N. R. Dhar

To say that this is an exciting situation is to put it mildly. But if Dr. Dhar is right, and he seems to have done the experimental work to prove it, we seem to be on the threshold of something spectacular. The first phase of work, the foundation, was accomplished by Sir Albert Howard in India. Here is another phase which was done in that same country. Since Dr. Dhar is the head of an important department in the largest agricultural university in India, and since his papers, which have recently come in, give the results of highly scientific experiments, we must take advantage of this new technique. It was anticipated by Sir Albert Howard in his sheet composting process, which is what Dhar now suggests. By placing our organic matter in a thin layer in the field and discing it in the upper four inches there is a much slower oxidation than in the composting process, and in the field, says Dr. Dhar, more nitrogen is fixed. In the composting process we know that nitrogen is low, usually less than 1% of the total mass. In sheet composting it would be much higher.

As I see it, therefore, the organic method would now consist of applying ground up raw phosphate rock and potash rock as well as other types of rock which will be studied and developed. It would take in the growing of green manure crops and the use of sheet composting, that is, the application of manure and residues of green matter such as weeds, corn cobs, leaves, etc. directly to the field and letting it decay there rather than in a compost pile. When conditions are not quite right for sheet composting, the Selvi process could be used, that is, making compost in enclosed pits or silos with cement bottoms. The sheet composting process will save much labor. There will not be double handling. The liquid essences would stay on the field where they would be used. The organic matter should be disked in rather than allowed to remain on the soil as a top-dressing. In the latter case, the effect of a dry spell would be to burn out some organic matter.

It must be borne in mind, however, that to be a good organiculturist, the farmer must be on the lookout to find organic matter that originates outside of his farm. This is not as difficult as it seems, if the farmer has the will and the enthusiasm. For example, nearby may be a cider-mill that sends hundreds of tons of apple pomace to the dump each year. The farmer could pick up a load of vegetable cuttings in town from a vegetable store every once in a while, or egg-shells from a chick hatchery, leather dust from a shoe-factory, a cutting of weeds from a neighboring field owned by absentees who never farm it, obtaining permission of course, corn cobs given away free by mills, wood shavings from lumber mills, cannery wastes, water hyacinth from rivers in the south, sea-weed, spoiled milk from dairies, leaves from city streets. When you figure the saving in not buying chemical fertilizers it pays to spend some time and labor with a truck on the lookout for free organic material.

The Rodale Farm

To old followers of organiculture, what I have written may appear to be too drastic a change, but from an inside position in the organic farming movement many unusual experiences have come to my attention over the years that have contributed to the making of this decision. At this time there is no space to go into them, but there will be a continuous discussion of the whole question in these pages in future issues. I feel it is important to save people from spending money in building pits which will be obsolete before they are even used. One thing I *do* know—American farmers will not go back to the pitchfork. A method to be adopted on a wide scale must not be too difficult of application. Even if this new method were not quite as good, it still would attract farmers. But, I feel certain that the new mulch-compost-sheet method will be found to be an improvement. It won't take too long to find out.

On our farm, we are going to try to get away from making compost. We will work out some method of applying our organic matter right to the fields. In our steer barn we will follow the English fold-yard method which means that the manure is not taken out, but additional straw is thrown in every week or so, over the old manure. It is then cleaned out in the spring and is practically ready to go into a field where a crop is to be sown. We may construct a larger silo on the Selvi principle, or some other device, to store manure over the winter.

If Sir Albert Howard were here today I believe he would accept this change. When I introduced a change in his method by eliminating turning of the compost by introducing earthworms for that purpose, he applauded, writing glowing letters about the advance in the organic method, advocating the change in his publication, *The Soil and Health*. His own system was a *change* from the chemical method. It is to be expected that there will be further changes. Regardless whether they are made by me or others. If they are good, they will all contribute to the eventual death-knell of the chemical fertilizer concept. That was the prime motive of Sir Albert Howard.

We are now engaged in casting a bronze wall-plaque of Sir Albert Howard which will be a physical as well as a spiritual reminder to later generations of the inspired work of the founder of the organic farming movement. The more changes that are made, the more strength is given to the concept which he established. Sir Albert's favorite statement was that we must go from "strength to strength."

J. I. RODALE.

Why Chemical Fertilizers Are Bad

By J. I. RODALE

IT IS not necessary to use chemical fertilizers. In fact, chemical fertilizers are downright dangerous to use. One should never use the concentrated type of chemical fertilizers, such as superphosphate, nitrate of soda, muriate of potash, ammonium sulphate and the numbered preparations such as 10-8-8, etc. They are bad for many reasons. Sometimes, in order to make them soluble, other materials are added which are not absorbed by plants, but keep on accumulating in soils to their detriment. Superphosphate is such an example. The phosphate is taken up, but much of the sulphur remains to create an unbalanced condition in the microbial population of the soil. In nitrate of soda, the plant takes the nitrate but leaves the soda. The soda combines with other elements to form the equivalent of washing soda which is very caustic and injurious to soil organisms. Soda has a tendency to saturate the root-hairs and prevent them from properly feeding on desirable nutritional elements in the soil.

2. Chemicals tend to burn out the needed humus of the soil.

3. Chemicals form hard-pans. They are formed by the chemicals leaching downward from the surface layers of the soil and collecting in an impervious layer at some distance below the surface. The hard-pan excludes oxygen from the soil and also prevents the absorption of rain water.

4. Chemical fertilizers upset the general nutrition of crop plants. In the plan of evolution of plants it was not considered that they would be fed by artificial chemicals. Chemicals are too soluble.

5. Chemical fertilizers are a shot-in-the-arm method, like taking medicines. It is artificial and synthetic and is not healthy for the soil over long periods.

6. The potash, especially in the chemical fertilizer, causes an increase in the cellulose, a crowding out of the minerals, an increase of the carbohydrates and a reduction of the important proteins. It reduces the quality and the quantity of the proteins.

7. The chemical method is too complicated. It requires too much testing of soil, and sometimes causes crop failures.

8. Chemical fertilizers not only kill off organisms in the soil, but multiply the wrong kind of organisms.

9. Chemical fertilizers kill the badly needed earthworms.

10. Chemicals harden the soil, make cultivation difficult and increase flood hazards. The organic method improves the soil structure.

11. Chemicals cause the plants to have reduced resistance to disease.

12. Chemicals cause the seeds produced by the crop to lose their potency, if it is desired to use them for crop-raising. The variety soon loses the power to reproduce itself.

13. Soluble fertilizers have a tend-

ency to pick up moisture and become difficult to distribute in rainy or humid weather.

14. Fertilizers like superphosphate clog and corrode the distributing machinery.

15. Many chemical fertilizers are fire hazards. Some will explode.

16. Mineral nitrogen should not be left around carelessly as it is toxic to animals.

17. Some chemical fertilizers cause skin diseases to handlers of them.

18. Cyanamid, a chemical fertilizer is so high in artificial nitrogen content that it inactivates the nitrogen-fixing bacteria in the soil. There is sufficient nitrogen in the air which these bacteria can take under proper soil management. Nitrogenous fertilizers, as well as the potashes, tend to crowd out minerals because of a forced cellulose development in the plant.

Dr. H. A. Curtis of the Tennessee Valley Authority, on Aug. 26, 1949, said that the liberal use of nitrogen fertilizers (artificial) "effect a mining of the soil, a process which already has made deserts of great areas of once rich agricultural land. The TVA is one of the world's greatest producers of nitrogen fertilizers."

Chemical fertilizers are expensive, and much of their effect is lost by leaching out of the soils.

Eventually, chemical fertilizers reduce yields.

Bone Meal

Among the valuable sources of phosphoric acid, bone meal is the outstanding organic material, while rock phosphate and colloidal phosphate are the prime mineral substances. Bone meal is usually added to good chicken feed and, when shortages developed, was synthetically made of colloidal clay and superphosphate or from plain colloidal phosphate. Bone meal is also used in charcoal form for filtering purposes, especially in certain refining processes for sugar-making. The resulting product is discarded and would make a most excellent source not only of the major plant growth elements, but also of all the trace elements that sugar beets, and to a lesser degree, cane collect.

Bone Black is charred bone, with a nitrogen content of about 1.5 per cent, a phosphoric acid content over 30 per cent, and many traces.

Raw Bone Meal comes from bones that have not been steamed. Its nitrogen content is highest of all bon eproducts, usually 3.3 to 4.1 per cent, its phosphoric acid content is between 20 and 25 per cent.

Steamed Bone Meal, the material most commonly used, made from bones which have been processed for glue and fats, is lower in nitrogen, about 1.6 to 2.5 per cent, while the phosphoric acid content is around 25 per cent. Steamed bone meal has more easily available phosphorus than the other two materials, because this material breaks down more readily, since the glues and fats have been removed. It is also less easily attacked by ants.

PHOSPHATE ROCK VERSUS SUPERPHOSPHATE

By J. I. RODALE

ONE of the most common of commercial fertilizers is superphosphate. It is an incalculably harmful fertilizer. Why? Because the plant will take up the phosphate but leave large amounts of sulphur, which is a dangerous element if in excess in the soil. It has a harmful effect on the biologic life of the soil—the bacteria, fungi, etc. Let us see how superphosphate is made. The base product is raw phosphate rock of which there are large deposits in Florida, Tennessee and some of the Western States. Since the phosphate in this rock is raw or inert and supposed to be unavailable, or insoluble or slow-acting, a method was devised to make it or a great part of it immediately available to the plant.

This is done by mixing large quantities of sulphuric acid with the rock, in a process that turns out a fine powder, loaded down with sulphur and phosphate which don't do the earthworms in the soil any good. It kills many of them. The fertilizer companies like such a product because they can get a much higher price for it. They don't care too much to ship the raw rock because the freight on heavy tonnage is too much of a factor. A serious disadvantage of the superphosphate is that it inactivates many of the trace elements which are contained in the raw phosphate rock, such as boron, zinc, nickle, iodine, etc.

Something has happened in the last decade or two which has transformed the whole picture. It has crept up quietly so that even today the average farmer and agricultural college staff are not aware of this sensational development. In the old days the machinery for grinding the raw phosphate rock into a powder was quite crude so that the ground-up particles were coarse and did not break down too easily in the soil. But today there is such elaborate machinery available that the rock can be ground finer than talcum powder. Thus a sufficient part of it is immediately available to the plant because the particles are so tiny that the bacteria and carbon dioxide of the soil can break them down quickly.

I was amazed to read a few years ago, in the November 30, 1946 issue of the Science News Letter to be exact, of an experiment conducted by Dr. Neil W. Stuart, U. S. Government plant physiologist at Beltsville, Md. in which the results were summarized as follows: "Another money-saving discovery is the use of ground-up crude phosphate rock..... The plants get as much phosphorus as they need, without the necessity of adding costly phosphates to the nutrient solution."

This looked extremely interesting. For years we had been hammering away against superphosphates and now a Government investigator had shown that the raw crude phosphate rock was not to be waved away with the ivory baton of the agricultural scientists. In some of the Western states the farmers have been wise to the substantial savings effected by using the raw rock. Here are the figures for 1947 for the State of Illinois showing the entire amount of com-

mercial fertilizers used:

Superphosphate	48,396	Tons
Rock phosphate	707,868	"
Mixed Commercial fertilizers with numbered analysis	289,747	"
Other Commercial Fertilizers	26,083	"

Those farmers who used the 48,396 tons of superphosphate shown above are just throwing away money, at the same time reducing their yields as will be shown below, and harming their soil. Three strong counts against superphosphate. In spite of these figures, in other parts of the country practically no rock phosphate as such is used. Farmers, wake up! Save money, and at the same time build up the biological life and fertility of your soils.

Recently a farmer from Nebraska visited me and said he was thinking of changing over to the organic method. In discussing his present practice I found that he used large amounts of animal manure, raw phosphate rock and only small amounts of potash. He wasn't far from an organic basis. In many parts of the West, the use of raw phosphate rock is quite common.

In the December, 1948 issue of the Southern Farmer, published in Montgomery, Alabama, with a circulation of one million readers, a battle cry was sounded against superphosphate. Let me quote parts of their editorial:

"You can save from five to ten dollars a ton on phosphate by purchasing phosphate which has not been 'burned' by sulphuric acid.

"Natural phosphate will not leach from the soil. Rains will not wash it out. It remains in the soil until your plants use it. It is not water soluble.

"You can apply natural phosphate at any time, and benefit from it..... You cannot apply it too heavily, and 'burn' your crops. You can either broadcast or drill it in the row.

"Natural phosphate does not harden or clog your machinery. It is safe around animals.

"Modern technology has discovered the way to grind it finer than flour, or talcum powder. You can now buy it ground so that 85 per cent of it will pass through a screen so fine that it has 90,000 openings to the square inch.

"When phosphate is so fine, more surface area is exposed to the acid exchange process by which phosphoric acid is absorbed by plant feeder rootlets. This absorption is by osmosis, not by the phosphorus running up the plant in a stream of sap.

"Soil and chemical experts now agree that mixing sulphuric acid with phosphate rock is only a process of breaking down the phosphate rock. Why pay for expensive sulphuric acid when you can get the same results from machinery?

"Southern Farmer is prepared to show where untreated phosphate under legumes deposited more nitrate in the soil than superphosphate and even high-priced commercial mixed fertilizer. (University of Illinois' famous Mumford-7 plots.)

"Of course, in some Southern states, the Extension Service, and/or the regular fertilizer trade, strenuously oppose raw phosphate. One company has informed Southern Farmer that it cannot even ship its phosphate into Virginia. Farmers there have taken the matter up with one of their congressmen, who promised during his campaign a full investigation of the reasons why this natural phosphate is prohibited in Virginia.

"In Alabama, many farmers have had to ignore the Alabama Extension Service. The Alabama Extension Service and Experiment Stations have gone to the point of conducting a full-dress exposition of why colloidal (natural) phosphate, for example, is far inferior to other phosphates, despite the proof to the contrary offered by the leading experiment stations of the Midwest.

"More and more results of experiments are coming to the attention of Southern Farmer. Besides those mentioned in our last several articles, we note that the University of Oklahoma has published the following figures:

CRIMSON CLOVER

200 lbs. phosphate rock with 400 lbs. lime	4,175 lbs. HAY
200 lbs. superphosphate with 600 lbs. lime	3,620 lbs. HAY
200 lbs. phosphate rock	3,920 lbs. HAY
200 lbs. superphosphate	3,170 lbs. HAY

The Missouri Agricultural Experiment Station shows:

	bu. corn	bu. oats	bu. wheat	lbs. clover	lbs. timothy
Manure, Rock Phosphate	41.0	38.0	27.5	4,138	5,425
Manure, Superphosphate	38.4	32.4	28.3	3,584	5,066

"As will be noted here, untreated natural phosphate showed up better in every instance (but one) than superphosphate. These results are in addition to previous proof we have submitted on this highly controversial question."

This article speaks for itself. In fact it shouts, so I do not have to dwell further upon it. But there is one more development, a sensational one, which I am sure that Organic Farmer readers will be interested in. When we attacked the use of superphosphate, the experts, including those in the U. S. Dept. of Agri. said we were cultists, and intimated therefore, that we did not know what we were talking about. We said we did not like the sulphur residue left in superphosphate. Now, look what's happened. At the Tennessee Valley Authority, TVA, they have perfected a process of producing a phosphate fertilizer without the use of sulphuric acid. It is done by melting the raw phosphate rock in a shaft furnace at a temperature of 1300° centigrade. It is called defluorinated phosphate rock. If you want information about it write to TVA, Wilson Dam, Alabama.

Now we don't want to take any credit for this because TVA by 1942 had already developed the process, but we do want to show that our "rantings and ravings" against superphosphate have a scientific basis. It also begins to look as if the gap between the organic and the "commercial" method is narrowing. And to the agricultural colleges we say it is about time that the left hand finds out what the right hand is doing, and that they begin to experiment to see if they can take the sting out of the other commercial fertilizers.

We do not suggest a rush for this new defluorinated phosphate. While it is better than superphosphate, it still costs more money than the plain, untreated, raw phosphate rock.

The most important aspect of the victory is the taking of the sulphur out of the superphosphate. W. C. Greene in his book "The Cancer Problem" has shown that sulphur in coal smoke is one of the causes of cancer. His book was published in 1914 in Scotland, and it is amazing that as early as that, he attacked the use of sulphur in fertilizers as a cause of human cancer. The Rodale Press (Organic Farmer) takes great pleasure in announcing that it has just completed arrangements to bring out an American edition of this book. It will be out late in 1949.

Cattail Reeds

Such material, often easily obtainable when ponds are cleared, should be used for fertilizer in fresh form, since the straw is very hard to break down, partly because the nutrients have receded into the roots, and partly because stalky material cannot be properly moistened and brought into intimate contact with nitrogenous material.

How to Select Seed Corn

By DR. WILLIAM H. EYSTER

CORN in Europe and other countries is another word for cereal and refers to the small grains. In America, corn refers to Indian corn or maize. The discovery of America was the discovery of Indian corn or corn as we commonly call it. Had it not been for corn, doubtless many or all of the early colonies in this country would have ended in tragedies. Corn is the

The tassels of selected parent plants are covered by a heavy paper bag which catches the pollen.

The ears to be pollinated are covered by transparent bags which keep off unwanted pollen.

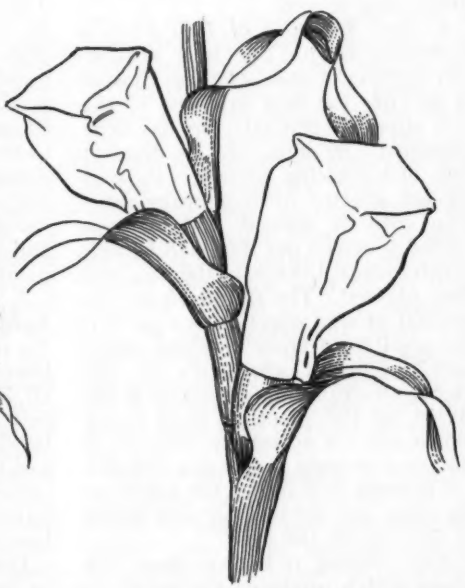
backbone of American agriculture. It is probably the oldest of all cultivated grain crops, if not of all cultivated plants. It has been modified by selection and breeding to such an extent that today it is totally unsuited to exist outside of cultivation.

When the white settlers reached North America they found the Indians growing native varieties of flint, flour, gourd-seeded-dent, pop, and sweet corns. The principal contribution of the white man has been the development of the dent varieties, and, more recently, the carefully formulated hybrids.

The improvement of corn through breeding and better cultural practices has occupied the attention of American farmers ever since this crop has been grown. According to the records even the Pilgrims, "began to thinke how they might raise as much corne as they could, and obtaine a beter crope than they had done....."

The selection by farmers of ears and/or plants that appeared to have made the best growth and yield on their own farm has resulted in hundreds of named varieties. It is because of this that varietal names of corn are less significant than those of almost any other field crop. Most corn plants shed most of their pollen before their silks appear so that individual plants are largely cross pollinated. This results in the plants being both extremely heterozygous and variable. This

Pollen caught from the parent plant is sprinkled on the silk of the selected ear.



The ears are then covered again to keep off undesirable pollen.

means that an ordinary corn field has all kinds of plants ranging from poor worthless, barren plants to superior, high-yielding plants. No crop offers a breeder richer material for selection and improvement. To develop and maintain a reasonably uniform type of corn within a variety requires consistent selection over a long period of time. The varieties of corn that have been developed by selection are as different as the ideals and methods of selection practiced by the different breeders. Extensive trials have shown that there may be greater differences among strains within varieties than between varieties. The more common methods of selection will here be referred to as *mass selection* and *individual plant selection,* or *line selection.*

Mass Selection

In mass selection the farmer selects what he considers the best ears or plants for seed. The kernels from all ears are shelled together to form a single mass of seed.

1. *Mass Selection of Ears from a Harvested Crop.* The least satisfactory method of mass selection consists of picking the best ears out of the crib after the general crop has been harvested. By some, this is done at time of harvesting, by others the ears are not selected until planting time. The corn is shelled and perhaps graded to screen out the small kernels which form at the tips of the ears, and then planted. The objection to this method of seed selection is that it is not possible to know anything about such important characters of the plants which produced the ears as the ability of the plant to resist being blown over by storms, the capacity of the plant to resist insects and diseases, the number and size of the leaves on the stem, and the number and height of the ears on the stem.

Also nothing is known about the plants which produced the pollen to fertilize the kernels on the ear. Strange as it may seem, the pollen parent has as much influence on the nature of the offspring as the seed parent which produced the ear. It is quite possible that the kernels on a large ear may have been pollinated by a plant with such poor heredity that it was unable to produce an ear. Under these circumstances the crop grown from seeds taken from a large, show-type ear may be most disappointing. From these considerations it is clear that seed corn should be selected before the ears are harvested and put in the crib with the general crop.

2. *Mass Selection of Plants in the Field.* The selection of seed corn should begin with the growing plants in the field. Superior plants, *i.e.* plants with good strong root systems, stout stem, large and deep green leaves, well-placed and large ears which appear to be free from diseases and insects, should be marked in the field just as soon and as fast as they are recognized. This may be done by slipping a large string-tag around the stem or by driving a stake bearing a flag in the ground near the plant. The ears of the selected plants should be harvested before the rest of the crop. The selected plants may be numbered in order of selection and all pertinent facts for each plant recorded in a notebook or on a tag fastened to the plant. The harvested seed ears should be suspended in an airy place where they will dry naturally. Some farmers prefer to store the dried ears and shell the kernels off the cobs at planting time.

3. *Mass Selection of Plants in the Field with Inferior Plants Eliminated.* To prevent inferior plants from pollinating the selected plants, detassel all inferior plants within 20 feet of each of the marked plants. This must be done before any of the inferior plants shed pollen. This practice will prevent the selected ears from being fertilized by plants obviously of poor heredity.

Detasseling the inferior plants will in no way interfere with their producing a crop. The under-sized ear which they produce will be fertilized

by neighboring plants. Having detasseled all inferior plants in the vicinity of each selected plant, the ear of each selected plant will be pollinated by plants with good-yielding capacity. In this case both the seed parent and the several pollen parents surrounding it are strong, high-yielding plants. The seed produced in this manner may be expected to produce a crop of high-yielding plants.

This method of field selection gives the farmer seed from good parent plants without the work and expense of maintaining a separate breeding field. The actual cost of producing seed in this manner is very little and the farmer is paid large dividends for the time and trouble he has taken to provide a high grade seed corn for his crop.

4. *Mass Selection of Plants in the Field with Controlled Pollination.* The selected plants may be pollinated by specially selected pollen plants in the same field. If this method of producing seed corn is to be used, the ear shoots of the selected plants must be covered with paper bags before any of the silks appear. A heavy craft paper bag may be used for this purpose. Or better yet, use a glassine or cellophane bag made with cement which will not open when exposed to the weather.

When most of the silks have emerged from the ear, the ear is ready for pollination. The plant which has been selected to serve as the pollen or male parent must be shedding pollen at this time. A day before the pollination is to be made, fasten a 12-pound heavy craft paper bag over the tassel of the pollen parent. Corn pollen is very short lived. The following day any foreign pollen which may have blown on the tassel of the pollen parent will have died, and all pollen in the bag will be the plant's own pollen. Bend the bagged plant over gently and shake the pollen out of the anthers by bumping the bagged tassel against one of your arms a number of times. Then slip the bag with the pollen off the tassel, carefully remove the glassine bag from the ear of the plant to be pollinated, and shake the pollen over the silk of the selected ear.

A vigorous plant at the height of its pollen production will yield from one to two tablespoonfuls of pollen. After the pollen has been well dusted over the silks of the selected ear, slip the large tassel bag down over the ear and fasten it around the stem. This large bag is an indication that the ear has been pollinated, and it serves as a protection of the ear until it is mature. When the seeds are well matured, harvest the bagged ears before the general crop is harvested. These ears are very valuable and should be dried and stored with great care. The number of ears to be prepared in this manner depends upon the amount of seed that will be needed to plant the next crop.

Ear-to-Row Selection

The ear-to-row method of selection is a somewhat more elaborate method of breeding seed corn than the methods of mass selection which have already been discussed. According to this method, the farmer selects ears of corn from the crib or preferably plants from the field. The value of the ear varies according to the care that has been exercised in its selection. If the ear is selected from a plant which has been protected from the pollen of inferior plants, or a plant which has been pollinated under controlled conditions with pollen from specially selected superior plants, it will be correspondingly more and more valuable. The selected ears are harvested before the regular crop in the field, dried in an airy place, and stored until time to plant the following year.

From each ear which is carefully numbered enough kernels are removed to plant a row including 100 plants. According to this method there will be as many 100-plant rows as ears that have been selected. This ear-to-row breeding plot should be isolated from other corn fields by

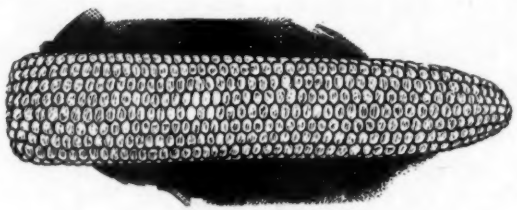
being removed to a distance of at least 80 rods (about a quarter mile). The plants in each row are carefully observed throughout the growing season for such characters as ability to resist lodging, general vigor, freedom from diseases and insects, number and size of ears, height of ear above the ground, and time of maturity. From each of the 10 best rows, the best 10 or more plants are selected for the breeding plot the following year. If any of the rows are obviously inferior, all plants should be detasseled so that they play no part in pollinating any of the plants in the breeding plot. The remaining ears in the 10 best rows with enough ears from the other good rows are selected for planting the crop the following year. This method of selection can be repeated year after year or until a distinct strain has been produced.

Regardless of which method of selection is practiced, continued selection is important for maintaining the strain with the desired combinations of characters.

Importance of Farm Selected Seed

There is an old saying to the effect that corn should not be grown farther away from the place where the seed was produced than one can see. This is only another way of saying that corn is extremely sensitive to local conditions. A corn which may give good results in one region may prove to be a poor variety in some other region. It is this circumstance that makes the home selection of corn seed such a valuable farm practice.

Home selected seed lacks the uniformity of commercial hybrids and is thus better able to fit itself into a field which often varies considerably in soil type, drainage, and exposure. The so-called open-pollinated strains of corn are also better able to take advantage of climatic differences than is possible for a highly bred, uniform hybrid in which all plants are genetically the same.



A perfect ear of corn.

THERE will soon be published THE ORGANIC FOOD DIRECTORY, to be printed quarterly, in which will be listed those who have organically produced food for sale. It is expected that within a few years the distribution on each printing will amount to a million copies. At the start the cost of listing will be nominal and will increase as the circulation increases. It will be printed in different editions, one for each broad region of the United States.

For a listing write us, detailing fully what you have to sell, and what is the method you have followed in growing it. Write to:

THE ORGANIC FARMER

EMMAUS, PENNA.

FARMING IN SWEDEN

By R. S. MOLLER

PERHAPS I should call this story "Farmers of Fifty Centuries," since archaeologists tell us that farming has been carried on in Sweden for five thousand years. Before that time, the people were largely hunters, trappers, and fishermen.

An old Swedish legend tells us that Sweden was densely populated at the time of the great Deluge (Noah's Flood). Now modern archaeology says that the climate of Sweden was much milder 3000 years B. C. when farming began in Sweden, than it is now. Furthermore, Bible chronology gives the date of the Deluge as 2349 B. C. I do not know when or how the legend originated, but it is surprising that it antedated the researches of archaeology!

Those Stone Age farmers of five thousand years ago cultivated both two- and six-row barley and two kinds of wheat. Of their daily agricultural practices we know very little. But apparently the care of livestock was far more important than the growing of crops. Since the climate was warmer than now, the pasture season was longer, and less substantial buildings were needed. About 1800 B.C. bronze tools were introduced. This was a great advance. But those happy days were not to last forever. The climate became colder and wetter. During the first thousand years B.C. the climate became very severe. The outlook was dark, indeed. But in those dark and bleak days, the people first became acquainted with the use of iron (about 600 B.C.). Iron tools must have filled the people's hearts with as much hope as the atom bomb has filled our modern hearts with dread and despair.

Excepting the improvement of agricultural tools, progress in agricultural methods was slow. For centuries it seems to have been the custom to grow crops on the same land year after year, with no idea of rotation, until the crops became so poor that planting was no longer worth while. The land was then allowed to grow up to weeds for as many years as was necessary to bring it back into reasonable production again. Pastures were dressed with wood ashes to get rid of mosses and weeds. Not only barley and wheat were grown, but some vegetables and root crops also. Potatoes were, of course, unknown. Rye was introduced, first summer rye, then winter rye. Oats were often grown on outlying fields that were seldom or never manured. Since forests were abundant, leaves were fed to the livestock in winter, especially to sheep. Gathering leaves was almost as regular a job as was haying. The value of manure was known but apparently it was not handled in the best way.

When more land was needed for cultivation, a likely piece of woodland was selected, the trees cut down, the usable lumber, fuel, etc. removed, the leaves saved for winter feeding of livestock, the brush thrown back on the land and set afire. Usually root crops were grown on this land, at least the first year. They grew bigger and tastier there, they said. Then

grass was planted which usually grew vigorously.

The reader may well ask, "Why was not Swedish farmland destroyed by such apparently careless farming methods?" For several reasons. Even today only one-tenth of the area of Sweden is plowland. Another tenth is water (lakes and rivers). Nearly six-tenths are forest. The rest is miscellaneous, including barren mountains and glacial areas. The rivers, lakes, and offshore waters teemed with fish. How old the custom was or how widespread, I do not know, but farmers did feed their livestock on fish! This added fertility. So did the use of wood ashes. The farms were practically self-sustaining. Very little was sold off the farms. Sometimes taxes were paid in butter—which removes very little fertility. Most of the land was in grass or in crops like wheat, oats, rye, barley, flax, etc. Crops like corn, cotton and tobacco which require a lot of row cultivation were unknown or rare. Even today only one acre in twelve of Swedish plowland is in cultivated row crops. Compare this with America where one acre in four is in corn alone!

Another factor was the climate. It is well known that European climate is less violent and changeable than American climate is. Sudden, heavy cloudbursts (as we call them) may be known, but are very rare. The pelting of bare soil of row crops by hard rains injures the soil structure. The winter rainfall of Sweden is low. This lessens the danger of washing away the soil in winter when the soil is more likely to be bare than in summer.

In the thirteenth century (seven hundred years ago), a regular three year rotation began to be adopted by Swedish farmers. This rotation was: first year, fall-sown seed; second year, spring-sown seed; third year, fallow. The surprising thing to me about the old records is the amount of land in fallow. Sometimes land was fallowed every second year.

In the late 16th century, 90% of the people were farmers, another 5% lived in the country, but were not farmers, the other 5% lived in towns. About 94% of the farms were run by their owners. Yields of grain per acre or hectare are not given, but from 4 to 7 bushels were harvested for each bushel sown. The highest yields were on the clay soils near Uppsala. Other crops grown were pears, beans, turnips, flax, hemp, hops, carrots, cabbages, onions, mustard, herbs, and flowers near the house in the kitchen garden. For every 100 inhabitants in 1571 there were 45 milk cows, 54 sheep, and 27½ pigs. In the United States in 1940, corresponding figures were: 37 cows, 42 sheep, and 55 pigs.

In comparing these two sets of figures, we should remember that, first, animals were smaller then than now, and second, fish and game were very plentiful in Sweden, especially fish. Goats were very numerous but figures on their numbers are not given. Forty-seven percent of the cows were in the two provinces of Westgothland and Smaland, which, in my estimation, have the largest people of Sweden today. However, the animals would look like runts today. Imagine an ox of 500 pounds, a cow of 300 to 350 pounds, and hogs only half as heavy as today! A cow that gave 1000 quarts of milk a year was considered a very good cow. The milk seems to have averaged close to 5% butterfat, which is quite high. A goat was expected to give enough milk to make about twelve pounds of cheese a year. I don't know if this was the old brown "mesost" or what. Even sheep were milked. One reason for the small size of animals was the poor winter feed. Hay and straw are hardly enough to carry livestock through a six months feeding season in winter in the best of health. Little grain or roots were fed.

In 1683, a Pastor Erici preached better farming as well as better living. Here are some of the things he said: "Grow peas on your thin and poor land. When they are in full bloom but have not podded, mow them

down. When they have withered, plow them into the ground. Care for your manure. Don't let it waste away in sun, wind and rain. Compost the urine with sod. Put the coarse straw in the barnyard where the cattle will tread on it and break it up. (The barnyard was an open space, usually surrounded on three sides by buildings, where cattle could be fairly comfortable on mild winter days.) Don't lose the fertility of the manure after it is spread on the field. Don't haul the manure out to the fields in winter because the fertility will be lost before you can plow it into the soil. Protect your manure and care for it until such time as you can plow it in as soon as you have spread it on the field. The best time to spread the manure is St. Bartholomew's time (August 24) because by that time the manure will be well rotted and no weeds will start growing in the fields. (I do not have Pastor Erici's directions for composting the manure, but since Swedish winters are long and rather cold, it would take until about August 24 to compost it and break it down into humus.) Gather leaves, chaff, soap-ashes, hemp, sweepings, and other things that will rot. Spread unslaked lime over the fields and you will both manure and get rid of weeds." Mostly very good advice, I'd say.

Linne (usually called Linnaeus in America) earned his greatest fame for his work in botany. But he also studied Swedish farming and in the 1740's and 1750's he travelled extensively in Sweden. He reported rotations which included peas, barley, rye, wheat and flax, but there seems to be no consistency in the rotations. Fallowing every third year was still very common and on many of the poorer soils fallowing every second year was frequently practiced. If crops were grown more than three years in a row on a piece of land, the fallow was usually carried on at least two years. When flax was grown, it usually followed the fallow. In the province of Halland, they had a rule about seeds: Seed which grew on sandy soil is sown on clay soil, that which grew on clay soil is planted on "mulljord." This was said to increase the yields. I can't find the word "mulljord" in my dictionary but "mull" means mold, *e.g.* leaf-mold, and "torvmull" seems to mean sod or turf after it has been composted, so "mulljord" must mean a soil that is mellow with mold or compost. "Jord" simply means earth or soil.

In the 1860's and 1870's, farmers cooked most of the slops for the pigs. Grain and roots were used for feeding livestock as well as people, but the great increase in the growth of root crops for fodder has come since then. Nowadays the sugar beet industry of southern Sweden furnishes a valuable feed for animals. Small potatoes were planted. I don't mean the smallest runts but rather the potatoes on the small side. On the island of Gottland (not the province of Westgothland) potatoes were cut up in pieces for planting, as in America at present. But in several other places the whole small potatoes were planted as they were. The potatoes were healthier that way, it seemed. In parts of the country it was common to cook the coarser grasses and the mosses and lichens before feeding them to the animals. This was most common in the far north. Manure was valued very highly. Apparently some farmers used human wastes, possibly composted, on their crops because one farmer complained that a visitor had "taken to the woods" instead of using the accommodations on the farm! "How wasteful," said the farmer.

No other nation has as long a record of political freedom and independence. Sweden was formed by the union of the two former kingdoms, Swealand and Gothland, about 600 A.D. I have no record that Swedish farmers before that time did not have a say in their government. Sweden had a nobility and a king for many centuries, but the Swedish farmers have hung on to their liberties.

The average yield of some crops in

1871-1875 were: wheat 22 bushels per acre, rye 22 bushels, barley 27, oats 37, and potatoes 103 bushels. In the 1920's the yields were from 10 to 50% higher, according to crop and year. Grains yielded best in southern Sweden but hay and potatoes yielded best in the north. Swedish soils are far from the most fertile in the world. The rainfall is sometimes disappointing, and the soils have been cultivated for so many years, that the yields in the 1870's with little chemical fertilizer forcing look good to me. Mr. G. Bendz, agricultural attache of the Swedish Legation in Washington said, "It is not easy for an American to understand the care, almost love, with which the Swedish farmer tends his soil and manure." He says that Swedish farmers often compost their manure, and quotes an old saying, "Manure is the farmer's gold." The value of lime has long been known, but an old saying is, "Lime makes rich parents and poor children."

The use of fertilizers other than lime and manure and incidental wastes began about 1850. The first used was guano. In recent times the use of chemical and other artificial fertilizers has increased rapidly. In 1933, Swedish farmers used 92,400 tons of nitrogenous fertilizers, 204,400 tons of phosphates, and 59,300 tons of potash fertilizers. Plowland and pasture totaled 12,046,790 acres. How strong the fertilizers are, or how acid, I do not know. Mr. Bendz seems to think that artificial fertilizers have not adversely affected crops or animals. He thinks that the excess forcing of cows for high milk production is hard on the cows. Ernst Hoijer wrote in "Sveriges Jordbruk" in 1924 that high milk production causes a quicker turnover of the cows and therefore requires a larger percentage of young stock, because the cows are "used up" faster.

A study of Swedish farming methods versus American methods does not show any outstanding differences such as one would expect if one judged by the rapid destruction of American soil and the permanence of Swedish farming. The Swedes have winter about like winter in New England and New York and summers like the maritime provinces of Canada. In early April, spring work begins in southern Sweden and gradually moves northward so that in the farthest north, planting does not begin until late May or even early June. Like other oldtime farmers, the Swedes have a lot of sayings about planting in certain phases of the moon and certain hours of the day, but not all farmers follow them by any means.

As for soils, America has every kind of soil that Sweden has and many more besides. Most of Sweden is of the old Archaean Rock formation and origin. This is mostly woodland and mountain land at present. It is not good farming land but it does produce wood with a lot of iron in it, good wood in more ways than one. This soil contains besides iron, cobalt, copper, nickel, silver, gold, and phosphate of lime, according to Paul du Chaillu. Most of the farmlands of Sweden are formed of or from sandstones, limestones, and shales of the Cambrian-Silurian formations, the second oldest formations of the world. Parts of the Silurian formations are very deep, yet contain no fossils whatever. Skane, the most southerly province, is of the Triassic, Jurassic, and Cretaceous formations, old but not as old as the rest of Sweden. Skane is sometimes called the garden spot of Sweden. Since some soil "scientists" tell us that the oldest formations tend to produce poor agricultural soils, of low nutritional value, Sweden presents a rather perplexing picture. Sweden's soils are said to be deficient in phosphorus. Whether they were always so, I do not know. But taken as a whole the Swedes seem to have had as good bones and teeth for almost countless centuries as any other people. Of course the use of fish in the diet may have helped here. Whether Sweden's farms will stand the strain of modern farming, time alone will tell. Whether the oldtime custom of fallowing does something

for the soil that nothing else does, I cannot say. The United States Department of Agriculture does not seem to think very highly of fallowing, except in rare instances. Any great *single* "secret" of Sweden's agricultural permanence I have not found. It seems that America has too much land in cultivated row-crops and too many acres bare in winter. Since Swedish land was generally fallowed after grain, the grain stubble plus volunteer growth helped prevent erosion. It may be necessary to change some fundamental farming practices in America on account of the difference between American climate and European climate. The most economical methods of composting should be worked out. How to economically mulch corn, cotton, roots, and vegetables to protect the soil is another problem. Swedish farming methods have not been perfect. They just happened to have been good enough for the climate and social and economic conditions prevailing through the centuries. Without the extensive forests, the abundance of fish, the less violent nature of the climate, and the self-sustaining type of farming followed, the results might have been different.

An ensilage cutter being used for grinding leaves. Notice consistency of whole leaves next to cutter and shredded leaves in pit.

From India–

AN ORGANIC CURE FOR ALKALI DISEASE

By N. R. Dhar
N. N. Biswas, E. V. Seshacharyulu and N. N. Pant

Editor's Note—*The following article is a condensation of a booklet published by the Indian Institute of Soil Science. It is a record of experimental field trials on alkaline soils made with the help of a grant from the Imperial Council of Agricultural Research.*

THE reclamation of alkaline lands is one of the most pressing agricultural problems in our country when the demand for food is growing day by day. Various methods of reclamation have been tried. The application of costly chemicals like gypsum, alum, sulphuric acid, sulphur, etc., has been tried, especially in Hungary, Russia, Holland and the U.S.A., with a fair amount of success. Some American soil workers also claimed to have obtained good results in reclaiming alkaline soils by merely leaching out salts from the soil by flooding with water. But these methods of reclamation, beside being inadequate for Indian soil conditions, are too expensive for poverty stricken Indian peasants.

Unlike the soil of temperate countries, the Indian soil is difficient in organic matter and in total nitrogen. This significant fact must be taken into account when studying the problem of alkaline land reclamation in our country. Unless an attempt is made to raise the organic matter and nitrogen status of the soil, mere addition of inorganic chemicals to lower the pH value of soil will not be of much use to the reclamation process.

The main characteristic of these soils from the biological point of view is that they are very deficient in microbial population. The carbon (organic matter) status of these soils is also considerably less than that obtained in the average garden soil. The calcium status of our soils is, in general, low and the absence of exchangeable calcium is well marked.

Cheap organic materials like cow dung, mustard oilcake and such by-products of the sugar industry as molasses and press-mud and their mixtures have been utilized in alkaline soil reclamation. For the sake of comparison, some experimental plots have also been treated with gypsum and a mixture of "Kankar" ($CaCo_3$) and press-mud.

Methods of Application of Reclaiming Agents

The fields are first plowed and then the reclaiming agents are applied to them. Molasses is first mixed with water and then sprinkled uniformly over the fields. Press-mud, cow dung and Kankar are broken up into small bits before being applied to the fields. Powdered oilcake is sprinkled, like gypsum, on moist fields. Where a mixture of press-mud and molasses has been used, the press-mud is spread on the fields and then molasses mixed with water is sprinkled. After the application of these materials the fields are watered and the soil is turned

over. Care must be taken in watering that the water does not run out of the fields.

Changes in Microbial Numbers

From our results it will be found that the bacterial count is maximum in the case of those fields which received the maximum dose of molasses, *i.e.* 10 tons of molasses per acre. Bacterial growth has been found to be proportional to the quantity of molasses added. When 10 tons of molasses were added, the bacterial count ranged between 10 and 14 millions per gram of dry soil. When two tons of molasses were added, the bacterial count was five million per gram of dry soil.

On the addition of ten tons of press-mud the bacterial count increased by three million units while with five tons the count increased by only one million units. Similar results were obtained with oilcake and cow dung. In the case of gypsum, practically no increase in the bacterial count was observed.

It is clear that bacterial growth is promoted by the application of organic manures, like molasses, oilcake, cow dung and press-mud while pure chemicals like gypsum, etc., do not bring about any bacterial change in alkaline soil, which is inherently deficient in microbial activity.

Changes in pH

In general, there is a fall in the pH value of treated soils from the neighborhood of 10.5 to nearly 8.5 units and this fall was maintained long after harvesting was done. From the results of chemical analyses of soils it is observed that bicarbonated and carbonated alkali in most cases has been completely removed from the soil after treatment, and this change is more prominent in plots treated with molasses.

Changes in Total Nitrogen and Organic Matter

It has come out clearly from the results obtained by us that the carbon and nitrogen status of treated soils has definitely improved in all cases excepting in those plots that have been treated with gypsum alone, and this status has been maintained even after harvesting. The tilth of the soil has also improved markedly in its power to hold water in treated plots. The best results in this direction have been obtained by treatment with a mixture of molasses and Kankar. The alkaline soil has very little organic matter and it is impervious to water, but by the addition of organic reclaiming agents both these defects have been greatly remedied. The calcium status of treated soils has improved in all cases excepting in cow dung treatment and with a low dose of oilcake.

The best crop has been obtained from plots treated with ten tons of molasses and 5 tons of Kankar per acre. The yield on these fields was 115 pounds of barley per acre. Fields treated with ten tons of molasses and two tons of oilcake yielded only slightly lower. With lower doses of oilcake and press-mud the average yield has been poor. Two plots treated with gypsum had no yield at all while another yielded 73 pounds per acre.

Castor Pomace

After the oil has been extracted from the castor bean, a residue is left that is widely used as an organic fertilizer in place of cotton seed meal, because the latter is valuable also as feed. The nitrogen analysis of castor bean pomace is the decisive factor. It varies from 4.0 to 6.6 per cent, while phosphoric acid and potash analyse from 1 to 2 per cent, with greater variation occurring in the phosphorus content.

An Experiment in Plowless

By ROBERT RODALE

John Moyer, a farmer who uses no purchased fertilizers or sprays, showing a box of Essex potatoes grown by his "back to nature" method. ▼

owess Farming

A potato plant from a test plot that yielded the equivalent of 600 bushels to the acre. Disked in soy beans and manure were the only fertilizers used.

◀ Sample ears from Moyer's seed corn plot. He uses only domestic corn, so he is able to grow his own seed.

"SPEND no money for fertilizers, spray or seed" is an eastern Pennsylvania farmer's solution to today's agricultural problems. John Moyer, a young man with an active mind, has spent six years working out a real "back to nature" farming system that he hopes will someday have wide recognition. He has combined elements of Edward Faulkner's "no plow" theory with portions of the Organic Method to develop a method of farming that shows promise of making possible the production of large, naturally raised crops at little cost.

The basic parts of Moyer's method are his disk and his "fallow one year in three" policy. His disk is an International Harvester offset disk harrow with blades 24 inches in diameter. Although it was designed for California grove cultivation, Moyer uses it to "plow" all his fields. The only standard plow on his farm is a one-horse model he uses to clear roadside ditches.

Moyer's Farmall "H", a medium sized two plow tractor, can pull his big disk one half or three quarters open as easily as two 14 inch plows.

This International Harvester Dyrr disk harrow is used by Moyer instead of a plow. Its 24 inch blades prepare an excellent seed bed.

He can disk two acres in an hour, the same amount of time it takes to plow. When he first started to disk instead of plow he found it necessary to go over the field as many as eight times. His fields did not have much organic matter. Now, he seldom disks more than four times and often prepares a good seed bed on his third time over.

"Since beginning to fallow every third year I am making more money, despite the loss of crop revenue from the fallowed field," Moyer explains. His yields are larger and he spends no money for fertilizers or sprays. "I do more than simply fallow my fields," he continues. "I plant cover crops and disk them in. I have found that soy beans and sweet clover work best in my soil. The soy beans add considerable amounts of nitrogen."

For several years Moyer used Ladina clover as a soil improver, but he had little luck with it. He found that it shrivels in dry weather and it adds little to general soil fertility. Below average yields of potatoes were characteristic of soil previously seeded to Ladina. Moyer still favors it for use on his chicken range, however.

"Turning under the sod is foreign to the nature of soil," says Moyer. "The ideal farming method would involve no cultivation at all, but thousands of years would have to elapse before the soil could be built up." Moyer compromises with that ideal technique of soil improving by disking in the cover crops instead of allowing them to rot on the surface.

Moyer has decided that a three year rotation is best for his soil. The first year he fallows his field by planting a soil improving crop.

The second year of the rotation Moyer plants a row crop, like corn, potatoes or tomatoes. After that he

In this picture the disk is half open. If run over this heavy weed patch once or twice more it would make it ready for planting.

puts in grain—soy beans or oats after corn and barley or wheat after early potatoes. About once in seven years his fields get a spreading of chicken manure, but no other fertilizer is ever added. Moyer feels that the natural action of the earthworms and bacteria will maintain the proper pH of the soil.

Recently, Moyer had an experience that makes him feel that his method will eventually make possible the raising of spectacular crops. Seeking to determine the merits of the Essex potato, a new variety, he planted a trial plot of two rows in soil which had received the soy bean cover crop treatment. The plot was disked, not plowed, of course. He planted one half bushel of seed in the two rows and harvested twelve and one half bushels. Converted to a larger scale, this would mean 600 bushels to the acre. Moyer considers a potato crop successful if he takes 250 bushels from an acre.

"The harvest on this test plot of Essex potatoes certainly was spectacular, but I hesitate to predict yields like this on a larger scale," says Moyer. "I planted the two row test plot in part of my truck patch, and that soil gets more than its share of manure. However, I think that the several disked in soy bean cover crops there were more than partially responsible for the big yield."

Moyer always uses his own seed. He feels that seed grown on his own healthy, unchemicalized soil is stronger and more capable of producing better crops than seed he might buy. He saves money, too. The savings on potato seed alone are $1000 a year. He also raises soy bean seed for his cover crops.

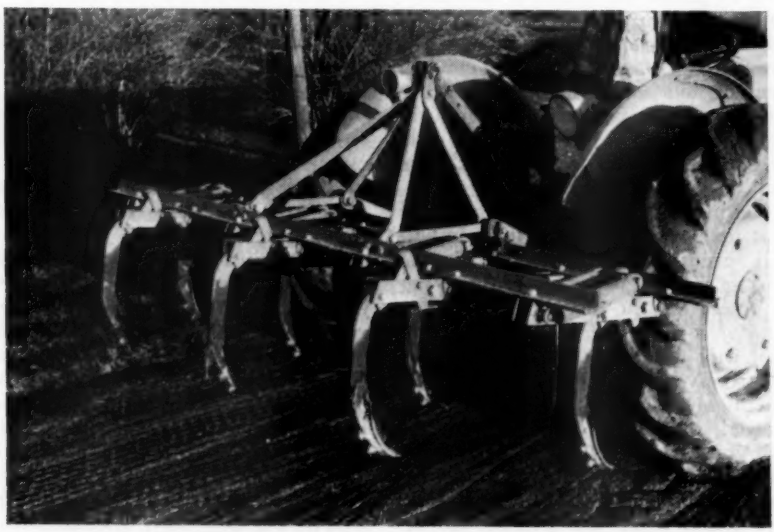
Every year he grows a seed plot of field corn from which he selects his seed for the next year. (See the article "How to Select Seed Corn" elsewhere in this issue.) "I placed my seed corn plot in a different place each year,"

says Moyer, "but I always make sure to put it on one of my most fertile fields. When the corn is ready to be harvested, I go through the plot and take the ears off the best looking plants. I judge the plant by the strength of its stalk, its root system, its freedom from disease and insect infestation, the height of the ear and the length of the husk. When I have all these ears husked, I go through them and pick out the finest, best shaped ears and use them to plant next year's seed plot. The remaining ears from the selected plants are used to plant the next general corn crop."

Moyer's corn has been yielding about 80 bushels to the acre and he has little trouble with lodging. In keeping with his "back to nature" policy, Moyer shuns hybrid corn. He uses Golden Queen domestic corn, a variety that was grown extensively in his area before the days of chemical fertilizers. In the early days of the chemiculture era it had to be abandoned because it developed a tendency to lodge. Only 50 per cent of the stalks of an average crop remained upright. Farmers stopped using it and switched to the firmer stalked hybirds. Moyer has resurrected it, and in his healthy soil it has become a profitable variety.

John Moyer never expected to be a farmer. As a boy he thought of the city and a "white collar" career as he plowed his father's fields. After going to high school he left the farm, but soon concluded that the farmer led the best life and he returned to his family's farm.

Edward Faulkner's book, "Plowman's Folly," made Moyer think about the value and correctness of many of the farming practices he had been taught. "Is plowing in keeping with the nature of soil?" he asked himself. He also wondered whether it was necessary to spend large amounts of money on chemical fertilizers and sprays. In the true missionary spirit,



A Ford field harrow which is used by Moyer to prepare a deep seed bed for potatoes. No other crop requires this extra treatment.

John Moyer decided to find out. He turned his entire farm into an experiment. His object was to devise a really natural method of farming that would be practical on any farm anywhere.

His yield figures did not soar right away. It took several years of fallowing, disking in cover crops and manuring to build up the health of his soil. He made mistakes at first. "I depended too much on Ladina clover as a soil improver," he says. "If I had used soy beans from the start I would be four or five years ahead in the building up of my soil."

Searching for the right farm implements took several years. At first he used an ordinary disk to prepare his seed beds. His soil was hard packed because of its low humus content and it was necessary to weight down the disk with a mound of rocks. Now his soil is springy and soft and the disk churns it up readily. Moyer also found that a "field harrow" helped to loosen the soil to a greater depth, a necessity when planting potatoes.

John Moyer has not made a fortune farming by his new method, but he can see the possibility of soon making substantial profits. He has no outlay for fertilizer, sprays or seed. He doesn't even use lime. Soil no longer washes off his fields, as it once did, because his humus-laden land can hold practically every drop of rain. He does not spend time making compost. He feels that farmers will not abandon their chemicals if they think they have to make compost as a substitute.

From both a practical and a theoretical standpoint, Moyer has developed a good farming system. Many farmers may soon follow him "back to nature."

A Simple Biological Soil Test

By LLOYD K. ROSENVOLD, M.D.

A COUPLE of years ago a nearby water reservoir was being drained and the accumulated silt hauled away. The silt had accumulated for years from water that had been piped down from the mountains and I assumed that possibly it contained minerals of value to help build our depleted soil. For the price of hauling I secured two large truck-loads for my garden only to be assured by "someone who knew" that the stuff was no good and was "dead."

My curiosity overwhelmed me and to determine if the silt had any value I devised a simple biological test, using a fruit box about 24 x 12 x 6 I placed a thin removable board in the center, dividing the box into equal halves. One side I filled with garden soil free from worms and the other side with the silt to be tested. In each half I then placed twenty adult red worms, removed the thin divider and obliterated the space left by removing the board. The contents of the box were then moistened, covered and allowed to remain for about a week.

At the end of the week a divider was again pressed across the center of the box and the contents of the two halves carefully emptied and the worms counted. It was found that the worm count in the silt was higher than that in the soil, proving that some of the worms had left the soil and entered the silt.

The results seemed to indicate that the worms found something desirable in the silt and therefore, it might be useful in my garden. Obviously the silt was not a balanced soil, but it probably contained soil nutrients of value and we proceeded to apply a thin layer to our soil.

Guernsey Calves Help Solve A Fertilization Problem

By E. R. KUCK

Reprinted from Better Crops With Plant Food

THIS story has its setting in the combination calf and maternity barn, built in 1945, to better control the hazards involved in the birthing of calves and bringing them through the critical first 60 days of life. Great care was exercised in the planning of this building, particularly with regard for ample space, provision for proper lighting and ventilation, and a type of construction which would lend itself best to thorough sterilization and fumigation. The reason for this enterprise was to substantially eliminate the high mortality rate (23% to 41% annually) among our new-born calves.

Title to Brookside Farms, New Knoxville, Ohio, was acquired in 1933 and a general farming program featuring a pure-bred Guernsey dairy herd, pure-bred Poland China hogs, and a 500-layer flock of White Leghorn chickens was inaugurated. The farm originally consisted of 180 acres in two units. Subsequently three additional farm units were leased, involving an additional 240 acres. Much of this land has been in cultivation for 100 years and the soils are principally Miami silt loam, Crosby clay loam, and some rich Brookston loam.

Having had the advantage of an agricultural college training, (Purdue 1920-Ohio State 1922) and having a natural inclination to scientific study, I introduced all the latest ideas and procedures in soil and animal husbandry that came to my attention. Careful records concerning each enterprise have been kept since 1933.

However, the employment of all the latest scientific principles involving poultry, swine, and dairy cows did not permit me to fare any better than most of my neighbors. A high mortality rate with young chickens caused me to drop the poultry program in 1939. A high mortality rate with pigs caused me to abandon the swine-breeding program in 1940. Today the entire farm program at Brookside Farms is devoted to dairying, and in this we have had no small amount of discouraging experiences, especially with a high mortality in young calves, with mammary disturbances in the milk cows—both milk fever and mastitis—and, of course, the ever-present problem of shy breeders.

The foregoing background brings us to the present status of Brookside Farms with a normal milking herd of about 100 head of milk cows, 50 bred heifers, 70 open heifers, and about 40 head of bull calves. All of these animals, excepting the bull calves, are grown to maturity and given an official production test during their first lactation period, after which they are sold on the basis of an automatically applied price formula based on the pounds of butter fat produced.

Under the above program there are approximately 120 calves born each year. When 49 of these calves died in one year it was not only a disappointing experience but it also represented a real economic loss. It was because of this heavy mortality rate that the mod-ned and built.

This barn 28' x 72' was constructed of clay-tile building-blocks with all the inside walls plastered with a two-coat plaster application. Ample win-

dow lighting and ceiling ventilation were installed. The barn was started in November 1944, and was put in use about April 15, 1945. All the walls in the 16 individual calf stalls were given a rough coat plaster application and six of these stalls were given a finish coat plaster application. The other 10 stalls were not completed with the finish coat until the latter part of October 1945. All of the stalls were promptly put in use, but our experience with the calves remained the same. They kept right on turning up their heels with the same symptoms as before.

Symptoms

The following symptoms prevailed: Calves were born weak with slow reflexes and no appetite; dietary scours developed in 100% of the cases, 50% of the cases were accompanied by low type of pneumonia with much coughing; calves that died invariably went down with convulsions and no calf ever to go into the convulsion stage lived beyond six hours. Strong, disagreeable odors always were present in the stalls. Calves that lived through the first 90 days showed remarkable recuperative ability and matured to good size without any signs of these calfhood disorders.

Attempted Treatment

Thousands of dollars were spent to find a practical cure. Every type of treatment involving the entire list of sulfa drugs, vitamin tablets and vitamin preparations of every description, blood transfusions from the mother, calf scours serums and vaccines, modification of the milk formula graded down to pure skim milk, special prenatal feedings to the mothers—all of these were tried with no change in the general results.

Discovery

As previously explained, six of the calf stalls had been completely finished with the finish plaster coat and the other 10 had only the rough coat application. The observation that, for some reason the calves were severely mutilating the finished walls in each of the six finished stalls was almost immediately made. No particular thought was given to this at first except as to whether it would pay to have the other stalls finished if the calves would mutilate the walls any way. Then one day the belated thought came to me: Why are those calves trying to eat the finish coat from the wall? Close inspection revealed that the rough-coated walls had not been touched.

A partially filled bag of the material used for the finish plaster coat was at hand and I requested the manufacturer to send me a detailed chemical analysis of the materials used in the finish lime material. Considerable correspondence followed and it was learned that this material was prepared from a heavy dolomite lime, analyzing:

Calcium Carbonate $CaCO_3$	53.94%
Magnesium Carbonate $MgCO_3$	45.47%
Other elements	.59%
	100.00%

This company also sent their chemist to our farm where for several days we made exhaustive soil tests from all of our fields and found the following:

The natural deduction, based on the foregoing information, led me to assume but one answer— the element

Element	No. of samples	Lowest reading	Highest reading	Average for farm
pH	17	5.4	7.2	6.36
Nitrogen (Parts per M)	17	25.0	60.0	35.0
Phosphorus (# per acre)	17	50.0	100.0	70.0
Potassium (# per acre)	17	120.0	220.0	180.0
Magnesium (# per acre)	12	very low	low	very low plus

magnesium. A carload of this material was immediately ordered with 4 drop the poultry program in 1939. A ness to go through a 200-mesh screen for mineral supplement feeding and 40 tons to go through a 100-mesh screen for pasture and field application. The car was unloaded August 25 and our extensive experiments started from this date.

Feeding Practice

Regardless of season, it has been our custom to feed a grain ration supplemented to provide a 16% protein ration. The supplement used was manufactured by a nationally prominent feed manufacturing concern and was guaranteed to contain the mineral elements necessary to heavy milk production. Nevertheless, we always added to this ration an additional 40 lbs. per ton of a mineral mixture made up as follows: 40 lbs. of 98.4% pure calcium carbonate, 40 lbs. steamed bonemeal (or 40 lbs. defluorinated di-calcium phosphate if bonemeal was not available), and 20 lbs. of salt. This formula has not been varied since 1938.

On August 25 I ordered a change in this home-mixed mineral as follows: Substitute dolomite lime (54% $CaCO_3$: 45% $MgCO_3$) for the pure 98.4% calcium carbonate used previously and add 40 lbs. additional dolomite lime to each ton of feed mixed. This order was predicated on the assumption that the calcium carbonate content would remain about the same as with the 98.4% pure calcium carbonate used before, but the additional amount of magnesium carbonate would be fairly high.

Results

All of the calves in the calf barn were fed milk from the cows receiving this new mineral mixture. After about two weeks it was noticeable that the odor previously present in the stables was becoming less, and we noticed a considerable change in the droppings of the calves. We also noted a gradual increase in the thirst for water on the part of the calves between feedings. The calves became more alert and, as if by magic, the scours condition cleared from the older calves. The calves just born, however, still proceeded through the scours stage but soon recovered when put on milk. During the latter part of October the remaining 10 stalls were treated with the finish lime coat, using the same material as was used for the first six stalls, and not a single tooth-mark is to be seen on any of these walls to this date.

At this point we were satisfied that we had made a very important discovery. Then followed a long list of experiments that are still in progress some with very illuminating and striking evidence of the importance of the proper balance and the inter-relationship of certain major and trace elements

Other Observations

1. On August 25, there were 16 cows in the milking herd quarantined for mastitis. On September 15, 13 of these animals were entirely cleared without any other treatment. On October 6, a herd test was made involving 79 animals, only 2 reactors were found and they showed slight traces in one quarter. Today there is not a single animal in quarantine for mastitis on the farm. Previously the incidence of mastitis would affect better than 50% of the herd at one time or another during a lactation.

2. On August 25, we were carrying on our No. 2 farm 23 head of dry cows that had completed good production records but which we had not been able to breed. The pasture on this farm was treated with a 700-lb. application of the dolomite lime on August 27. Excellent fall rains produced a good pasture during the latter part of September and these cows ranged this pasture until in December. In addition, they had free access to the mineral in special boxes in the barn. On January 8, 1946, when these animals were bled for our periodical Bangs

and TB test, 18 of them were pronounced safely with calf by the veterinarian and 20 have subsequently calved on dates showing they were bred about October 1 or after. The same bull accompanied these cows throughout the year.

3. Milk cows that had been on the dairy mineral feed for at least two months before they were turned dry produced strong, normal calves that did not go through the scours stage. Check cows and heifers that did not have the advantage of the mineral mixture dropped calves and gave the same symptoms and results as before.

Field Crop Observations

The most striking evidence of the effect of this magnesium element remained to be found in the crops from the dolomite-treated fields. In an abnormally wet spring season, followed by one of the most severe droughts in late summer ever experienced in my immediate community, the results could be read without effort. The outstanding observations were briefly, as follows:

1. Because of an abnormal rate of rainfall following corn-planting season, the corn fields generally presented a mottled array of colors—a patchwork ranging from yellow to dark green. This phenomenon was attributed to drowning and excessive rainfall. However, these yellow areas were evident on high ground as well as in depressions. On the dolomite-treated fields, the corn retained a uniformly green color and the yellow spots were not evident except in a few isolated places where plants were in water for three or four days. However, it was noticed that these plants had a remarkable recuperative ability.

2. Where nearly all of the untreated corn fields in the immediate community were severely fired, the dolomite-treated 120 acres of corn on this farm remained green throughout and made a highly increased yield over the average of the community.

3. Following the third cutting of alfalfa hay the stand, generally, turned yellow and brown, giving the appearance of being dried up. The dolomite-treated fields are going into the winter with a healthy, dark-green color.

Indiscriminate use of magnesium salt may result in detrimental effects both to animal and plant health. Magnesium absorption beyond the optimum point in animals may produce a disease known as magnesium tetany, while overuse of it in the soil shows evidence of lowering the potassium intake of plants and will cause potash starvation. Much is still to be learned about this element but all indications point to a triumvirate relationship existing between calcium, magnesium, and phosphorus in such balance as these elements are found in nature, as, for example, in the egg shells of wild birds.

Corroboration

If this narrative has given you the impression of being a fairy tale, I do not blame you. I have merely set forth the facts as they have appeared at Brookside Farms. More than 30 eminent agronomists and scientists have visited the farm to see and study this peculiar problem. Hundreds of photographs have been taken and loads of soil and plant tissue have been carted away for further research.

I wish particularly to thank Dr. Fred Boyd, Agronomist and Midwest Representative of the American Cyanamid Company and Dr. G. N. Hoffer, Agronomist and Midwest Representative of the American Potash Institute, for their keen interest and active cooperation in this problem. Their on-the-spot analysis of soil and tissue samples have thrown much light on this subject. Their findings will be published after further experimentation is completed. However, it may be safely stated that from the evidence at hand magnesium plays an important role in plant, animal, and human life as do the other better known elements—nitrogen, phosphorus, and potash.

WHEN THE WORM TURNED

By JACK VAN CLUTE

WHEN the earthworm turned away from a farm in Skagit Valley, Washington, the landowner began thinking along new lines. In 1938 when I visited the 100,000-acre valley sixty miles north of Seattle, dairying was one of the leading industries. Huge barns were bulging with valley hay, stanchion rows were lined by sleek Holsteins, Guernseys and Jerseys, pastures were a carpet of deep green and meadows were heavy in second growth. Out in the field Old Dobbin was still earning his keep.

In the beginning, Skagit River brought down from its mountain headwaters a rich deposit of silt loam and spread it deeply over the valley floor. The loam teemed with earthworms, and it required no expert to realize that a handful of the soil was alive with countless microorganisms. And farmers were on the job to see that their soil kept alive. Portable carriers slung from overhead tracks carried stall manure out to windrows behind the barns. Annually there was a job of hauling the manure from windrows and spreading it on the fields, a practice which seemed to keep the land more fertile from year to year. The farmers had weathered the depression better than their brethern in less fortunate sections of the country. Proudly they told me that Skagit Valley was as fertile as the Valley of the Nile, and well could I believe them. For the land reflected prosperity. From the pastures some Whitcomb Riley might have been inspired to write another "Knee Deep In June," or a modern Whittier could have indited a streamlined version of Maude Muller driving the hay rake.

But when I re-visited the valley last summer, I found a transformation which I hold is unconducive to permanent agriculture. About one-third of the valley was given to intensified farming, with around 13,000 acres in wheat, rye and oats, 9,000 in freezing and canning peas, and over 5,000 in potatoes, flax, bulbs, and turnip, beet, cabbage and spinach seed production. Moreover, a large acreage had been planted to berries, which gave rise to many work camps for transient labor.

I spent several weeks on four farms and found that the soil, which, a decade ago was mellow and rich, now was compacted and dead. Why? The cows had gone to market and the big barns were empty and as silent as tombs. Nor was Old Dobbin to be seen doing his bit in the fields. In his place were tractors. A tractor is a great labor saver on the farm, but to date there has been invented no tractor which leaves a trail of organic fertilizer in its wake. There was no annual job of manure hauling because there was no manure. Organic farming had gone out, and the earthworm had gone with it.

Tempted by high prices for intensified crops, the farmers had turned miners, believing that heavier and heavier charges of chemicals in the ground would blast out bigger crops. Skagit River had given them one earth and they would make it another. Thus, the bag of chemical fertilizers had come to pre-empt the manure pile, and the wheel of life was out of balance of late. And Nature doesn't like to be trifled with that way. She responded not only with diminishing returns, but with inferior quality crops. Blight and insect pests loomed where practically none had been before. In three years one field of spin-

ach dropped from a return of $3,800 to less than $300. In 1947 a field yielded 1,000 pounds of turnip seed, with evidence of blight when the seed was re-cleaned. Last year the field increased its blight and dropped its yield to 400 pounds—for which the buyer paid two cents less per pound.

Some fields I visited were so hard packed that it required effort to stick a pitchfork in the ground sufficiently to make it stand alone. I found but little indication of an aerobic condition in the soil, and but few earthworms. But I did find the field man for one of the major pea buying concerns, and he reported having discovered a new and bigger type of aphis. Apparently a little hazy on the late Sir Albert Howard's lifework in soil research and plant growth, he seemed but slightly interested in the statement that insect pests were Nature's police on patrol to feed on disease-weakened plants, thereby pointing out where soil deficiencies existed.

During the past few years many fields were "treated" with insecticides dusted from airplanes which got on the job before the morning sun so that the dew would conspire to form a poisonous film on the plant leaf. When the farmer arose, he cast a weather eye not at the sky over head, but around the valley to see where the next dust storm was being applied at five dollars an acre. At first it was rather thrilling to see planes making a Roman holiday of pests. But despite the dusting, the aphis labored and brought forth a more resistant type, which in turn called for a more concentrated form of combat. So, instead of getting on the job by the dawn's early light, pilots waited for the sun, and then flew planes equipped with new gadgets and freighted with gallons of a more potent liquid spray to douse the fields.

Last season the new type of spray put a crimp on the aphis. But when the peas were vined (shelled), the tenderometer told a sad story for many a grower. The tenderometer is an instrument which registers the relative tenderness of green peas. And since Mrs. Jones of New York, Chicago and San Francisco prefers to buy tender peas, that's the kind which brings the highest price to the grower. However, during the past season, tenderometer reading revealed that peas were at their tenderest stage only a precious short time; after that, the readings seemed to drop abruptly from top-grade, $105 per-ton peas, down to a quality which brought about $40 a ton. In short, peas from chemically treated soils beneath and highly potent insecticides from above, do not remain long in the top-bracket stage of tenderness, a situation which gives many a farmer the jitters. If he harvests his crop when the first two pods on the vine contain tender peas, then he is sure of finding too many undeveloped pods above, with maybe a blossom or two at the top. If he waits to harvest a maximum of filled pods, then bingo!—goes the tenderometer and down drops the price, maybe as low as $40 per ton. And while the yield might run two tons per acre, yet $40 peas makes the grower reflect on a seasonal outlay of $25 an acre for seed, a like amount per ton for vining (shelling) costs, plus chemical fertilizers, taxes, machinery depreciation, worry, etc., and then he begins to wonder if the game is worth the candle. Last summer one field produced over forty tons of peas, but NOT one dime of net for the grower.

The farmer wonders all the more too, when he plows the pea stubble for next season's crop. He turns over clods and finds scarcely an earthworm. Decidedly, that is not like the good old days of balanced farming when soil was mellow and wasn't demanding such continual hard tillage to head off a new kind of pest—the weeds. For among other worries now, Canadian thistle, sow thistle and rye grass are appearing in fields, a condition which calls for a more powerful weed-killer. But when the farmer goes to town for some behind-the-counter advice which he gets along with a can of some new "discovery" for killing weeds, he reads a warning on the can—"Too frequent use of this spray will kill *all* plant

growth for a period of five years!" So what to do?

Right then is when the omnipresent "expert" comes to the rescue. Ignoring or ignorant of Sir Albert Howard's work in soil study and the Indore compost method, one seed buyer whose seasonal shipments are dropping sixty per cent, followed the traditional line of thought. He still believes that blight can be reduced to ashes, and that an insect can be stopped cold by first studying its family tree and then formulating a new insecticide that will do great bodily harm. "Burn your stubble—turnip threshings and all," he advised. "And then for next year, use 250 pounds of fertilizer per acre."

The suggested fertilizer, of course, was chemical, which already has left a poisonous residue in the ground to off-set the beneficial work of micro-organisms and discourage the earthworm which, like some elements, is only a trace in the soil. I was to windward when the advice was proffered, and I was glad to hear that the farmer's reply was in line with a suggestion made by Professor Wallace Brett Donham who instituted Harvard classes in Human Relations, and who would change many an office sign, "Do It Now" to "Think." (Collier's, Sept. 25, 1948, "How to Keep Out Of Trouble" —Whitman.) The signs of the times are making this farmer think for himself. "Well, I'll think it over," he said as he kept one eye on an adjacent field. That field, fertilized with barnyard manure last spring, produced nearly two tons of peas per acre and did NOT require insecticides.

When the farmer went into action for next season's crops, things were different than in the fall of 1947 when smoke clouds billowed in the wake of the "expert's" advice. He plowed under all threshings, weeds and rye grass the better to provide "fixins" for mycorrhizal association—an oasis looming on the horizon of his mind. And then, instead of letting tons of pea vines rot away in stacks, he hauled them on the fields to be plowed under. That practice, he realizes, is not as good as composting, but it is a step in the right direction. And finally, most heartening of all, for next year's garden and potato patch, he started a big pile of compost made according to Howard's Indore method. Last spring he broke virgin garden soil and applied chemicals; last fall he dug blighted potatoes from compacted soil.

For many Skagit Valley farmers the Weather Man proved to be a new pest the past summer; he doled out an unusually wet growing season, with the result that water stood on packed soils and prevented early cultivation. However, the compost-minded farmer doesn't hold much against the weather man. Inspired by Howard's *Agricultural Testament,* he believes that less chemicals and more organics would have put his fields in better condition for earlier tillage. He is a committeeman for farm groups, and I'm sure that any lead he takes in organic farming will be followed by his neighbors. But most reassuring of all is the fact that he is thinking for himself.

"On one of my farms, twenty acres haven't produced a thing but weeds and grass the past five years," he told me when I left for home. "I think I'll seed it down to pasture, and then get some calves. I have a big, empty dairy barn—also a big loafing shed. By the time the calves are a carload of steers, I'll have tons of organic fertilizer to help get that wheel of life back in balance. I'm thinking about that Southern Rhodesian farmer—Moubray, mentioned in Howard's book; he's made compost on a big scale, and a ton of it cost him only a day's pay for two natives. Last spring I paid $70 a ton for chemicals. And last spring, too, when I plowed up an old stack bottom, I noticed that I still had a few earthworms left there, at least enough to attract the seagulls, doggone 'em. And the peas that grew on that spot last summer were healthy and uninfested. So I'd better see about getting that prodigal earthworm to turn around and come home for good."

SOVIETS RAISE "TOP-HEAVY" WHEAT

Russian agronomists claim to have developed a strain of wheat that yields harvests three to four times as rich as ordinary types. Called "branched wheat" because of the branched structure of its heads, it must be sown less thickly than ordinary wheat or it will revert to the standard variety.

Stray heads of branched wheat have been popping up in Russian wheat fields since 1851, but until 1940 efforts to cultivate it have failed, say the Russians. In 1940, Semyon Makhatelashvili, a Georgian agronomist, planted the wheat in wider rows and was successful in raising a crop.

It is reported that the new wheat averages 150 to 200 grains per head, compared to the 30 or 40 of ordinary wheat, and has a firm stalk that prevents it from lodging in bad weather.

Russian scientists also claim to have developed a perennial wheat plant. U. S. research experts are skeptical of the Russian claims because they have sought for 15 years, with little success, for a hybrid wheat seed that would replant itself. Best U. S. results so far: first year, a normal yield; second year, output down 25%; third year, yield off 50% to 65%; and fourth year, little or no grain.

—U.S.S.R.

Above, samples of the new Russian "branched wheat." Below, ordinary wheat.

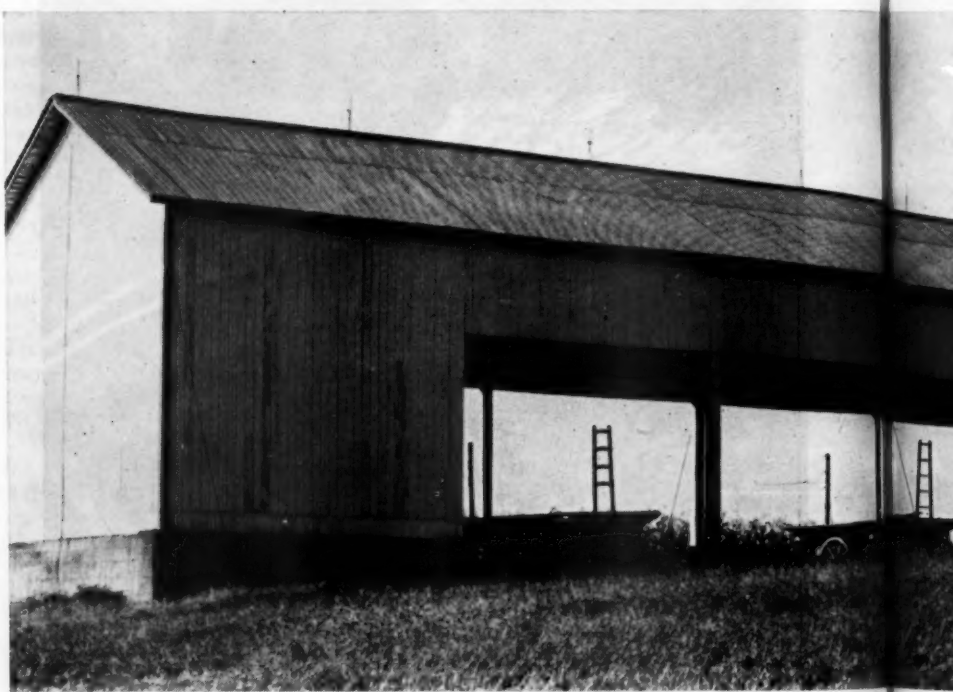
Memos To Farmers

Corn Crop To Be Nation's Second Largest

The government estimated on September 9th that the 1949 corn crop would be 3,525,741,000 bushels. Although over 100 million bushels smaller than last year, the size of the 1949 crop will be so large as to virtually assure Federal controls to hold down production. Attempts will be made later in the year to limit the 1950 crop to 3,000,000,000 bushels.

The bumper corn crop should assure plentiful supplies of cattle and dairy feed, but it may burden the government with a serious price support and storage problem.

Such overproduction should tend to show the farmer the value of fallowing some of his land. Hogging every inch of soil will mean less money in his pocket and less fertility in his soil. Our suggestion is that a farmer grow a pasture crop and take three cuttings a year, two to lie where cut and one to be moved to another field and disked in in preparation for a crop.



An unusual, but practical, farm building. Wagons and heavy implements not have

Don't Pasture New Clover Seedings Late

Many a promising new stand of clover or alfalfa has died out during the winter because it was grazed too long in the seeding year, warns C. J. Willard, associate in agronomy of the Ohio Agricultural Experiment Station.

It is advantageous, he says, to graze a new seeding of alfalfa or red clover down close once, preferably the middle to the end of August. After September 1 stock should be completely taken off the new seeding for the rest of the year.

The growth produced after September 1 looks in October as if it were standing still and might just as well be grazed, but it is producing materials which are stored in the roots, building them up to withstand the winter. Good roots cannot be produced without good tops. The growth is also valuable as a mulch to protect the crowns over winter. Don't pasture a new clover seeding late!

A new sweetclover stand is entirely different. For best growth of sweetclover to plow under next spring, do not pasture at all until the middle of October. Then the growth can be pastured clean with no injury. The growth of sweetclover is drastically reduced by any cutting or pasturing from the time the grain crop matures until near the end of the growing season, Willard concludes.

Protein Feeds Climb, Fishmeal Drops

Prices on high-protein-content feeds have been slipping steadily, making dairymen, poultrymen and hog growers happy. Soybean meal has dropped from its $100 a ton high this summer

implements not have to be backed in. The shed is also being used for storing baled hay.

to $81 in early September. Cottonseed meal has slipped from $77 a ton in August to $61. Linseed meal declined from $61 to $57 a ton.

Fishmeal, however, has been climbing. A new broiler ration requiring 8% fish meal instead of the usual 3% has swept the eastern broiler producing areas. The ration, developed by Dr. Edwin T. Singsen and Lloyd D. Madison of the Univ. of Connecticut, is supposed to put broilers in marketable shape in 11 or 12 weeks instead of the usual 15 or 16.

Red Banded Leaf Roller Becomes Menace

The Red Banded Leaf Roller, classified as a minor pest in 1946, has increased to an alarming extent in New York during the past two seasons. In some orchards this insect injured as much as 90 per cent of the crop last year, according to a report in "Farm Research" where it is stated, "there are grounds for believing that DDT is largely to blame."

Are Farmers Rich?

The realized net income of United States farmers dropped last year for the first time in a decade. However, they netted almost three times as much from their farming operations as they did in 1941, although the 1948 income would buy only about 30 per cent more family living than in 1941. Farm purchasing power reached its peak in 1943 with a net farm income of 12.1 billion dollars. In 1947 farmers netted a record 17.8 billion dollars, but this was actually worth less than the 12.1 billion in 1943.

Cocoa Wastes

Cocoa Shell dust analyses rather high in nitrogen for a product of this woody kind, namely 1 per cent. The phosphorus content is about 1.5 per cent, the potash content approximately 1.7 per cent. Usually theobromine and caffeine are first extracted from the shells, and the residues analyze 2.7 nitrogen, .7 phosphoric acid, and 2.6 potash. The raw, untreated shells are slightly higher, but must of course be finely ground to be useful as fertilizer material. Cocoa pressed cake has also been sold for fertilizing purposes, but the analyses vary according to treatment. As a rule, this cake is rather high in nitrogen, but lower than the shells in potash, while the phosphorus content is close to .9 per cent.

The chocolate factories have begun to market coco shell wastes which have been freed of the oil and the theobromin. In the extraction process, lime is used. The finished product, marketed under the trade name Ko-K-O, put out by Hershey's is without odor, weed seeds and acids, and therefore useful for mulching soils in acid regions, because the lime content will balance the acidity of the soils while the organic matter of the residue acts as a fine water-storage medium.

Colloidal Phosphate

In the process of phosphate mining in Florida, large residues of finely broken-up material developed. This phosphate is of a colloidal nature, but has not a high enough analysis to compete with superphosphate in the fertilizer trade. The material is therefore sold to feed mills and mixers to form part of the poultry, cattle, etc. rations. If you cannot obtain rock phosphate, you should be able to secure colloidal phosphate at a feed mill.

POISONS AND PURGES

By A. REYNOLDS MORSE

OCCASIONALLY organic farmers should have their attention drawn to excellent articles which typify the very antithesis of everything taught by the exponents of the organic method. Two such items are discussed here in the revealing light of organic principles.

First, I want to recommend the "Handbook and Record for Fruit Growers," 1949 Edition, (40 pp.) published and distributed by The Standard Oil Company (Ohio) without charge through their Technical Service, Insecticide and Fungicide Division, Room 1532, Midland Bldg., Cleveland, Ohio. Every organic farmer should have a copy—but not for the same commercial reasons advocated by the publishers!

This remarkable handbook gives an excellent description of the large number of modern, deadly sprays and poisons which one may be forced to use if the organic method is not followed. It lists in convenient chart form the time to spray, material to use, quantity, insects controlled, and "further information" for all orchard fruits of the mid-west.

I have called this book remarkable —and indeed it is to the organic farmer, because it demonstrates in irrefutable form the cycle our orchardists are enmeshed in. The impoverishment of orchard soils has made our fruit trees prey to such a host of parasites and diseases that had these plagues been as rampant in the past as they are today, few if any orchard trees could have survived the trying centuries before poison sprays were discovered.

A little pencil work with the handbook will prove the contentions made in *Pay Dirt, An Agricultural Testament,* and other organic handbooks, that the amount of sprays now required to "control" pests will not only result in permanently poisoned orchard soil, but in the production of fruit capable of carrying absorbed arsenic, lead, and toxic oils and tars often related by researchers to causes of cancer, directly into the susceptible belly of the consumer.

The long-term damage done by these complex poisons to the living soil or to the consumer of its fruits is very difficult to appraise for a variety of reasons. While the effect of concentrated fruit sprays and poisons is undoubtedly cumulative in the human animal, we are also facing an altogether different type of serious human problem: we are charging powerful commercial interests with purveying injurious (but profitable) materials! Many immediate livelihoods would be involved if it would suddenly be acknowledged that the Organic Method gave a superior type of protection against orchard pests. Yet there is incontrovertible evidence to this end!

Entrenched human organizations persist long after they have been proven out-moded. The use of poisons to control insects is fostered by economic interests which cannot afford to recognize the clear-cut evi-

dence in favor of the organic method constantly being produced in *Organic Gardening* and *The Organic Farmer.*

The soil is a vastly complex material. The human body is by far the most intricate mechanism on earth. The relationship between soil processes and our bodies' processes cannot yet be reduced to even the most general scientific terms. Factors are always being omitted. In the construction and use of the compost pile we find a practical method of relating the still hypothetical and unknown needs of our bodies to the ability of the soil to produce this vast complex. By returning to the soil some of the material we have mined out of it, we can again allow the natural forces which have allowed orchard trees to survive the pests of the ages to take renewed effect, and to work for the modern farmer. The handbook gives us a rough idea of the cost of trying artifically to control pests which can be accomplished by nature at no cost, if we return to the soil the elements necessary for its bio-chemical life.

A second article which vitally concerns the organic farmer is entitled "Fire and Brimstone Cure Diseased Soil" by Ladd Haystead in *Popular Science* for July, 1949 (pp. 104-8). Here we have a lengthy discussion (for *Popular Science*) of soil "pests" and how they may be "burned" out of the soil by a machine capable of "spouting its lethal flaming dose at the diseased soil particles." The article illustrates fumigated and untreated fields, showing the marked difference in crop growth after the lethal dose has "cured" the diseased soil particles! The flame-carrying points which are dragged through the soil not only sterilize "unwanted" parasites, but add "iron, ammonia, phosphorous, chlorine, calcium, nitrates and potassium in sufficient quantities to assure plant growth." The three major fertilizers are air-blasted into the soil in a separate operation. There is never any "destruction of the wanted soil bacteria" (pp. 107-8).

Let me quote another eye-opener: "George Tunado of Dutch Flats near San Diego, Calif., was in a bad way with wireworms, nematodes, beetles, corn-borer, and other root and foliage pests. He says, 'After treatment by the Woods machine, I grew excellent crops of sugar corn and carrots on land that had been too infested to grow anything.' "

A careful perusal of this truly amazing story will show the student of organic farming exactly what happens to soil when organic materials are not returned to it. The baffled farmer, unfamiliar with the simple principles of the organic method, believes his soil is full of "pests"—it is "diseased," "infested." The flame thrower burns out the "pests," and does not harm "the wanted soil bacteria," and remarkable results follow. The fields so treated undoubtedly get a tremendous temporary lift—a shot in the arm so to speak—from the "three major fertilizers, nitrogen, phosphorous, and potash" which are "air-blasted into the soil in a separate operation." However, the fundamental cycle of soil impoverishment and resultant disease-prone crops has not been broken. Only a new link has been added to the already long chain, but the end is still the same: "pests" and "disease," while the treatment with the strong chemical fertilizers in itself is sufficient to completely upset the biological processes of "the wanted bacteria" in the soil.

Unfortunately, we do not yet know now to measure in terms of human benefits the foods we produce, but foods from the living soil, unblasted by "fire and brimstone," if they could be tested by scientific means on human beings would reveal a story of health vs. susceptibility to disease which would cause the fire-blaster to scrap his equipment in favor of the Organic Method.

LIME

When limestone is burned it turns into calcium oxide or quicklime which is much too fierce in its action. It kills microorganisms and would not be a harmonious element in the biologic life of the heap.

The assassin of President McKinley was buried in quicklime for quick destruction. Sometimes quicklime is used for compost heaps made up of vegetable matter exclusively. Quicklime is also called burned lime or caustic lime.

When water is added to quicklime it becomes calcium hydroxide or hydrated lime. There is a violent chemical action and the material gets very hot. Hydrated lime should not be used in the compost heap unless ground limestone is not available. In such event it would be better to use wood ashes.

Lime in Compost Heap

First a thin sprinkling of soil is placed over the manure and then a thin sprinkling of lime. However, the two can be mixed together and applied at one time. This prevents the powdery lime from flying about.

Advantages

Q. Why is lime used in the compost heap?

A. In the compost heap it maintains the proper condition of alkalinity so that the microbes can perform their function of decomposing matter. The best range is between a pH of 7 and 8. It also helps to fix the nitrogen. It aids in the conversion of volatile nitrogen compounds into stable compounds.

LIME FORMULAE

Limestone	Calcium Carbonate	$CaCo_3$
Hydrated Lime (Slacked)	Calcium Hydroxide	$Co(OH)_2$
Burned Lime (Quick-lime)	Calcium Oxide	CaO
Chalk		$CaCo_3$
Dolomite	Magnesium Carbonate	$MgCo_3$
	Calcium Carbonate	$CaCo_3$
Gypsum	Calcium Sulphate	$CaSO_4$

Too Much Lime

Q. Would too much lime have some disadvantage?

A. Your question about lime cannot be answered without a knowledge of the soil of your land. You had best watch the outcome and judge by the appearance of your crops whether you put enough lime in the land. There is, however, one consideration: Lime and potash are in a way competitors and an excess of lime may effect the maturing of the plants and the quality of the grain if there should be a potash insufficiency.

How Much Lime?

Q. How much lime shall I use in my vegetable garden?

A. Ordinarily if lime has not been applied recently, a safe application would be a half to one pound to each ten square feet. If the land is on the acid side, use one pound. If it is not so acid, use a half a pound. If you use lime in making compost and your land is not acid use smaller amounts. If you have to use hydrated lime reduce the quantity by 30%.

Q. Which is the best lime to use?

A. We recommend the ground limestone, not the hydrated, slaked or quicklime. If the ground limestone is not available, use the hydrated, but never the quicklime. It will burn and kill bacteria.

Q. Is lime a chemical?

A. Yes. All matter, in the strict interpretation of the word, is made up of chemicals. Lime is merely a ground up rock (limestone rock). In our special consideration of the concept of what is a chemical fertilizer, we include only such things as synthetically produced chemicals, the inclusion of acids to raw rock materials, etc. The milder and more natural forms of chemicals are permitted. Lime and phosphate rock are such.

Q. How does fineness of grind affect its availability to growing crops?

A. On the basis of benefit to the soil in three years, H. B. Cheney, of Iowa State College, has worked out the values in this way:

Of limestone held on a four-mesh sieve (four spaces per inch), none is available in three years. It won't dissolve in that time.

If held on an eight-mesh sieve, 10 per cent will become available in three years.

If held on a 50-mesh sive, 40 per cent will be available in three years.

Limestone that goes through a 50-mesh sive is 100 per cent available in three years.

Hydrated Lime

Hydrated lime is too caustic for earthworms and other soil organisms. Use the plain ground limestone. Sometimes a bag is marked *agricultural lime* and is the hydrated type. Check on this carefully. Lime does not drive away earthworms. In the case of ground limestone, the neutralizing lime is released very slowly, whereas the use of hydrated lime is really a strong chemical treatment.

In the treatment of compost for quick results in transforming it for earthworm food, lime can be used to advantage. By treatment of the compost before it is impregnated with earthworms, the breaking down process is started quickly. Once the lime has been neutralized by chemical action on the composted elements, with dilution with water, then the danger to the earthworms and other life of the heap is obviated.

Old Plaster

Q. Shall I use old plaster?

A. Lime is so cheap that it would be best to discard your old plaster, as it is not ground fine enough.

Lime on Manure

Q. Can I put ground limestone on manure?

A. Yes. Do not put quicklime on manure as its chemical action will dissipate nitrogen. The ground limestone or even the hydrated will not react that way. The N. J. Experiment Station showed that the use of hydrated lime with manure fixed a greater part of the nitrogen. Prof. Emerson of Ames College, Iowa, has stated that limestone used either with plant or animal manure often increases its value as much as 400%.

Here is a quotation from the N. J. bulletin:

"The practice of applying hydrated lime on the floors and in the gutters of dairy barns has sometimes been condemned for the reason that it was supposed to encourage rapid ammonification of the manure with consequent loss of nitrogen.

"A study recently made in Vermont indicates that the caustic forms of lime, including hydrated, mixed with fresh manure may actually help preserve the nitrogen in the manure. The high basicity thus imparted to the manure retarded the production of ammonia. Thus a substantial saving of the nitrogen in the manure was effected where the manure was spread on the land or incorporated *into the soil before carbonation of the lime was completed,* which is in a few days or a few months, depending upon temperatures. It was noted, however, that where the caustic forms of lime were mixed with fermented manure, the ammonia already present was rapidly driven off.

"These experiments indicated that, where hydrated lime is applied in the gutters and on the floors and the manure is *quickly* removed from the stable and spread on the land, this practice is not only unobjectionable but the presence of this kind of lime even acts as a preservative of the nitrogen in the manure. Ground limestone *exerted* practically no effect on the manure, *whether fresh or fermented.*"

Bone Meal

Bone meal contains from 2 to 4 per cent of nitrogen and from 20 to 25 per cent of phosphoric acid. Bone meal also contains much calcium; consequently, its effect is to reduce soil acidity.

Analysis:

Calcium	31%
Nitrogen	1½%
Phosphorus	21%
Potash	0.2%

Bonemeal becomes available in a few months.

Carbide Ashes

We do not recommend the use of carbide ashes from miners' lamps as a substitute for lime because it contains only 10% calcium. Of course, if one has it it may be used but we prefer the ground limestone.

Chalk

Chalk has twice the bulk of lime but only half its value. It is not a good substitute for lime.

Dolomite

Q. Just what is dolomite? Does it have different qualities from other limestone?

A. Dolomite contains magnesium besides limestone, varying in quantities from very low to about 40 per cent. Many limestones sold commercially for agricultural and gardening needs are actually dolomites, though the analysis is not given on the bag. Magnesium tends to cut down on the potash uptake of the plant and thus produce a different composition of the plant. A lack of magnesium is a source of plant disease, an excess of potash has been by some scientists associated with cancer incidence in people.

The inclusion of magnesium carbonate in the lime is more effectual in neutralizing soil acids than the purest calcium carbonates.

Dolomite is considered to be better balanced than limestone. It is gradually absorbed by the soil and is less likely to be washed away than ordinary lime.

In orchards, dolomitic limestone prevents magnesium deficiency which contributes to apple-leaf scorch.

Do not put dolomitic limestone in animal feeds. The magnesium content is too high. Poor shell texture (of eggs) and bone development result from its use.

Gypsum

In Western arid soils which suffer from the dread alkali disease, no lime should be used in making compost, because it will accentuate the alkali condition. The compost should be acid. Some means must be found to acidify the soil and usually gypsum is used but we do not recommend it, because of its high sulphur content, which accumulates in the soil. The only cure for alkali disease is to pile organic matter into the soil. A large amount of leaves put into the soil will help.

Marble Dust

Marble is metamorphosed (changed) limestone, usually very pure, and crystallized by pressure and heat. It is sometimes used in some parts of the country instead of lime. Its chemical formula is the same as lime.

Marl

Marl is variable in its chemical composition. It occurs in ponds and lakes and sometimes in the bed of sluggish streams. It has been formed from snail shells and from plant chara, which has the power of taking lime out of the water in which it grows. When the plant decays, the lime settles to the bottom of the water and accumulates as marl. Marl for soil use should have at least from 75 to 80 per cent of carbonates, even for short hauls. Where it must be transported over longer distances, it should be equal to good limestone containing from 90 to 95 per cent of carbonates.

Analysis: Ca. 20 to 90 per cent.

It may be used in the place of lime.

Oyster Shells

While the main value of oyster shell flour is generally considered to consist in the lime and trace minerals, it was found according to Misc. Publication 136, U. S. D. Agriculture, that siftings from oyster shell mounds contained also .36 per cent nitrogen and 10.38 per cent phosphoric acid. This surprisingly high phosphorus content would warrant the use of such material in preference to lime whenever it is obtainable.

Oyster shells contain from 90 to 95 per cent calcium carbonate. When finely ground they are a very satisfactory liming material.

Wood Ashes

Wood ashes also act as an alkalinizer and may be used in the compost heap in a thin sprinkling just as a thin sprinkling of lime is used. Here instead of the calcium, the potash in the wood ashes acts as the alkalinizing agent.

Wood Ashes as Source of Nitrogen

Wood ashes contain calcium nitrate and potassium nitrate which are much more desirable sources of nitrogen than nitrate of soda, since both calcium and potassium enter into the plant structure, but the plant's need for soda is nil and it is a corrosive element in the soil, becoming the equivalent of washing soda.

Wood ashes are quicker acting than ground limestone.

Paper Ashes

Paper ashes should not be used as they contain strong acids and other harsh substances used in the manufacture of paper.

Lime Direct on the Land

Lime is used on the land because it neutralizes or alkalinizes the soil, making conditions proper for the working of bacteria. The lime also furnishes calcium and small amounts of minerals. It tends to aerate and flocculate or granulate the soil and make it crumbly. It ventilates the soil to allow seepage of surface moisture to the plant roots. In sandy soil it tends to bind the sand particles to

a more consistent body. After liming it requires less harrowing to break down clods after plowing.

Limed lands give greater yields and better quality crops. It will help to break down recently applied organic matter. Many plants are diseased because they grow in hard packed soil. Lime helps to correct this handicap. The use of lime helps to eliminate acid-loving weeds.

Tests show that the use of lime makes roots go deeper and reach levels rich in sub-soil minerals. It increases the availability of plant food.

When organic matter decays in soil acids are formed. Unless sufficient lime is used to neutralize these acids, bacteria growth slows down.

When Shall Lime be Applied?

There are different methods. One method is to apply lime every time corn is applied in the rotation. It is a good thing to apply it when waste vegetable matter is plowed in because it helps in its breakdown. The need of lime is usually indicated by the failure of clover and the encroachment of acid weeds, such as sorrel, red top, daisies, broomsedge, hawkweed, dewberries, etc. It should be applied at intervals of 3 to 5 years. It should be applied before the seeding of legumes, to give it plenty of time to sweeten the soil before planting. Some farmers apply lime with winter wheat because the wheat usually responds to lime and the legume crop that follows is greatly benefited. Lime may be spread on sod any time after haying and may then be plowed under with excellent results on subsequent crops. When sod is plowed the furrow slice is usually set on about a 45° angle so that the liming material is well distributed vertically and horizontally. For pasture improvement, lime should be applied in the fall. It may be spread on sod fields in winter.

How Deep Shall Lime be Placed?

Especially where there is a hard pan at the plow sole the lime should be plowed down deep. A small subsoil chisel which breaks up the pan and mixes the lime with the subsoil is recommended. The N. J. Experiment Station (New Brunswick, N. J.) has developed such a chisel. Also John Deere. The lime should be applied where the bacteria work, which is mostly in the upper five inches. Of course, rains will leach the lime down.

How Much Lime?

It has been found that smaller and more frequent applications of lime give better yields on the average than heavier and less frequent applications. Excessive use of lime may get the soil in such condition that plant food is not easily rendered available.

Approximate pounds of lime oxides per acre required to change reaction one pH unit when the organic matter content is

	low	medium	high
Clay and silt loams	1,500	1,750	2,000
Loams	1,000	1,250	1,500
Sand and sandy loams	500	750	1,000

The above is the recommendation of the National Lime Association. Evidently more lime is suggested where the organic matter is high to aid in breaking it down. Purdue University in Circular No. 204 (April 1939) said:

"Soils high in organic matter need lime less than do light colored soils of the same pH and clay soils, less than light sandy soils. However, the amount of limestone required to correct the acidity of light colored, sandy soils is less than that required for darker colored or clay soils of the same pH."

Lime on Orchard Soils

Orchard soils should be heavily limed.

J. I. RODALE.

Alfalfa mulches in an African citrus grove. The small box in the photo at right is six inches high and is half buried in rotting mulch among the growing alfalfa.

MULCHES IN RHODESIA

By J. M. MOUBRAY
Chipoli, Shamva, Southern Rhodesia

WE GROW a moderate acreage of tomatoes for canning and we mulch these with dry grass. This has the effect partly of conserving moisture, partly of keeping the tomatoes off the ground, as we do not stake, and partly of protecting the top layer of the soil from the fierce rays of the sun which prevent the aerobic nitrogen fixing bacteria from getting on with its work. Now we notice that the tomatoes are sending up tiny feeder roots above the surface soil into the mulch. In July, 1942, G. Ingham published a paper in the Journal of the South African Chemical Institute on "The Fertility of the Air." From his experiments, he proved that the air contains an appreciable amount of ammonia and mineral matter such as lime, potash, phosphates, etc. in colloidal form as aerosols. Plants are able to absorb these materials. It is possible that the tiny feeder roots of the tomatoes were after these aerosols when they left the surface soil and moved upwards into the mulch. Ingham suspended filter paper in the open and determined the amount of ammonia taken up by it. It may be that the mulch acts as a similar medium and catches the ammonia and aerosols. As with us the air is more often in motion than still. Fresh particles of air containing these aerosols would be continually coming in contact with the mulch.

Ingham exposed dishes of distilled water with similar results. He concluded that distilled water exposed to air became a nutrient solution, able to support the growth of plants. He states that these facts suggest that the mineral matter in the atmosphere has played an important part in the genesis of fertile soils. The amounts of salts from such aerosols are admittedly small, but they are evidently sufficient to make it worth while for the tomato to send up roots out of its natural feeding medium to collect them. As the crop progresses with irrigation the mulch gradually rots down to a compost. One can understand the tomato roots leaving the soil to enter this, but they came up into the mulch long before the compost stage was reached.

The two photos of tomatoes show what to us are new varieties. We try out everything we can get hold of. The small grape-like variety has a strong flavour and is good for chutney and preserves. The lemon shaped variety grows in large bunches. Apart from being very prolific it does not appear to have any particular properties.

We use an effective mulch among

Two new varieties of tomatoes. The small grape-like tomato on the left has a strong flavor and is good for preserves. The lemon shaped variety grows in large bunches and is very prolific.

our citrus trees. The trees are interplanted with alfalfa and when this is ready we run the mowing machine through it. The cut alfalfa is allowed to lie, so that a mulch is gradually building up among the growing lucerne.

The small box shown in the photo is six inches high and half buried in the rotting mulch among the growing alfalfa. The trees in the photo have never been sprayed or fumigated. The alfalfa receives dressings of raw rock phosphate and nothing more. The irrigation water is rich in lime and the underlying bedrock is potassium. The alfalfa and the atmosphere, through azotobacters, supply the nitrogen.

Legume roots, it has been found, can attach and render available as plant food unavailable salts of phosphorous and potash.

We have, of course, many orchards in which the soil has been abused and the trees are in bad shape, owing to the way we treated them in the bad old days, but we are gradually getting round to them and either replanting or pollarding them and interplanting with lucerne. Possibly the legume, Florida beggarweed, may also prove suitable, as it is, under our conditions, very persistent. We do not plant in rows, and our new orchards would be an unpleasing sight to South African growers who are used to perfectly placed rows. First we contour the land and build fairly high banks. Against the lower bank we plant the trees at 30 ft. intervals, thus leaving plenty of room for the mowing machine—this on sloping ground. On the flat ground there is of course no need to do this.

May I quote from "Mother Earth" a somewhat disquieting piece of news.

"A new virus disease, affecting citrus trees in Australia, is known as 'bud-union decline'. Tests carried out have shown that even before rootlet decay starts, starch contents of bark and wood disappear from parts of the root stock. The starch decline progresses along the larger roots until often there is no starch in the rootstock right up to the bud-union.

"Some Australian orchardists believe the disease develops regardless of cultural practices and is caused by lack of genuine soil fertility. They recommend that no artificial fertilizing should be used, but liberal dressings of compost should be forked over the root areas."

We have reached a stage in citrus culture in Southern Africa where, unless we gradually get back to more natural methods, things will gradually go from bad to worse.

The provident grower will make a start on a few of his orchards and as he sees the results there will be no need to press him to continue as fast as possible to get back to Nature's methods.

Where in the forest do you see anything equivalent to the plough, and what about the grass apple orchards and cherry orchards in England? I can remember old, old apple orchards in Warwickshire, which year in and year out gave magnificent crops, and for generations they had never seen the plough.

Livestock . . . .

75,000 Calves From One Cow

A single pedigreed cow of the future may produce 75,000 calves. Sir John Russell, president of the British Association for the Advancement of Science, said recently that a cow may achieve this fantastic total without ever undergoing the pangs of birth.

The new method of breeding cows takes advantage of the fact that a cow can conceive a large number of calves, but she cannot bring them all to birth. When the embryonic pedigreed calves are still small bits of tissue soon after conception they will be transplanted by surgery to common mothers. By that time all the purebred characteristics of the embryonic calf are fixed.

A cow normally produces only one ovum at breeding time, but the British say they can enable the cow to produce a dozen ova by the use of hormones from pregnant mares.

It seems that these British scientists are taking liberties with Mother Nature. The transplanting of thousands of ova is too drastic a change to be made in the miraculous process of reproduction. Like artificial insemination, it may result in a predominance of bull calves, a high rate of sterility or other complications. Long and thorough tests should be made before the transplanting of cattle ova is accepted.

SOIL AND HEALTH FOUNDATION

The Soil and Health Foundation was organized two years ago as a non-profit foundation. The purposes of the organization are:

(a) To promote, foster, and encourage the use of humus in the soil to prevent the further loss of soil.

(b) To conduct, foster, and encourage scientific research and to teach, train, inform, and educate the public concerning the fundamental relationships between the soil and all kinds of animal and plant life.

(c) To study the effects of organic and artificial fertilizers on soil and all kinds of life.

(d) To establish and equip laboratories, experimental farms, special institutions, and all manner of agencies to accomplish the purposes of the Foundation.

The directors and other officers are giving freely of their time and help without cost.

We invite all who want to have a share in the work of the foundation to send their contribution, much or little to the Secretary, 46 South West St., Allentown, Pa.

All who contribute become associate members and receive all publications of the foundation.

ORGANIC FOOD DIRECTORY

The Organic Farmer invites all who have organically grown foods for sale to list them in the Organic Food Directory. There will be no charge for listing your name, address, and organically grown produce in this directory. Write us, telling in detail what you have that is organically grown, detailing how long and in what manner you have applied the method. Write to

ORGANIC FOOD DIV.
THE ORGANIC FARMER
Emmaus, Penna.

BOOKS for Organic Farmers

Farmers of Forty Centuries

by F. H. King

Dr. King takes his readers into the fields of Japan and China to observe at first hand the agricultural practices which enabled those peoples to maintain their soils in a highly productive condition over a period of forty centuries. Cloth, 384 pp., 209 photographs. **$5.00.**

•

Bio-Dynamic Farming and Gardening

by Dr. Ehrenfried Pfeiffer

Describes in full the bio-dynamic methods for converting an ordinary farm into a bio-dynamic farm. Paper, 240 pp., 18 illus. **$1.75.**

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An Agricultural Testament

by Sir Albert Howard, C.I.E.

The standard textbook for farmers and gardeners who want to change from ordinary chemicals to home-made organic fertilizer. Cloth, 253 pp. **$3.50.**

•

The Earth's Green Carpet

by Louise E. Howard

Lady Howard, widow of Sir Albert Howard, shows that degenerative diseases are on the increase as a result of soil depletion by artificial chemical fertilizers. She stresses that Man's health and happiness depend upon the use he makes of "the earth's green carpet." Cloth, 260 pp. **$3.00.**

•

Grow a Garden

by Dr. Ehrenfried Pfeiffer

A goldmine of information for growing each vegetable from the bio-dynamic point of view. Paper, 118 pp. **$1.40.**

•

Memoirs of a Rose Man

by J. Horace McFarland

Contains the horticultural ideas and personal reminiscences of America's greatest champion of the rose. Preface by L. H. Bailey, introduction by R. C. Allen, biographical sketch by Robert Rodale. Cloth, 160 pp., many full-page photos. **$3.00.**

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by Dr. Ehrenfried Pfeiffer

A beautiful landscape is an index of a living soil which has not been exposed to bad agricultural practices. The author warns his readers against measures which surely lead to the deterioration of our fertile soils. Cloth, 183 pp., 60 illus. Frontispiece in color. **$2.75.**

•

The Soil and Health

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Food problems can be solved only by restoring to the soil its virginal fertility. Man has been and still is an exploiter, and most farmers are soil bandits. A remarkable follow-up to "An Agricultural Testament". Cloth, 320 pp. **$4.00.**

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An English gardener explains his system of organic gardening. Foreword by Sir Albert Howard. **$1.00.**

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The Pruning Book

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by Dr. Thomas J. Barrett

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Poultry . . . .

Grit of Variable Value

Heuser and Norris of Cornell University published in *Poultry Science* 25 (1946) 173 an article on various grits, oyster shell, ground limestone, etc. and their effect on poultry growth:

"The results of an experiment in which oyster-shells, calcite grit, and ground limestone were compared as sources of calcium supplementary to that present in a representative commercial laying ration, the mash of which contained approximately 1 percent each of calcium and phosphorus fed as supplements to the laying ration with crushed oystershell and calcite grit gave better results as supplements to the laying ration than ground limestone, especially during the latter part of the year. There was no difference in egg production between hens getting crushed oystershell or calcite grit. Egg production was significantly lower on ground limestone than for the birds receiving crushed oystershell or calcite grit. Body weight was better maintained in hens receiving crushed oystershell than in those receiving calcite grit or ground limestone. The birds receiving ground limestone showed higher mortality than the other groups. Eggshell strength rated in the order of oystershells, calcite grit, and ground limestone. Additional feeding of granite grit had a favorable effect on egg production and the pounds of feed required to produce a dozen eggs when fed with crushed oystershells or ground limestone. Calcite grit also had a favorable effect in this respect. Additional feeding of granite grit seemed to have no influence on body weight or mortality but a favorable influence on eggshell strength. Considering all factors studied, the best combination was the supplementation of the laying ration with crushed oystershells, calcite grit, and 8 percent ground limestone added to each 100 lb. of mash, with and without granite grit."

NUTRITION & THE SOIL

Thoughts on Feeding

by DR. LIONEL PICTON, O.B.E.

with an Introductory Essay on Creative Medicine by

DR. JONATHAN FORMAN, F.A.C.A.

Everybody eats. Everybody should know *what* he eats. Is the food of today fit to eat, or has mass production and processing made it synthetic—lacking in minerals, vitamins and other health-building elements?

In the U.S.A.—the world's best-fed nation—chronic illnesses and deficiency diseases are on the increase; mental illness and nervous disorders have become a frightening problem; half the population (judging by Army examination standards) is way below par; "one in 8 will die of cancer" etc., etc., etc.

With farmers plagued by every known plant and animal disease (mostly deficiency diseases) and ever-increasing swarms of pests, isn't it reasonable to say that a great deal must be wrong in the way our crops are grown?

Dr. Lionel Picton, one of England's greatest experts in the fields of nutrition and public health, came to the conclusion, arrived at from a lifetime of observation and testing, that *nourishing food can only come from crops and animals raised on organically fertilized soils*—a conclusion which should startle anyone familiar with modern food production methods. He gives his evidence for this sobering doctrine in *Nutrition & The Soil.*

Dr. Jonathan Forman, Editor of the *Ohio State Medical Journal* and vice president of Friends of the Land, an American pioneer in nutrition and soil relationships, has written a challenging essay by way of introduction to Dr. Picton's work.

NUTRITION & THE SOIL should be read by every doctor and farmer and gardener in the land. What Dr. Picton and Dr. Forman have to say cannot be laughed off. Bigger and bigger hospitals, national clinic programs, etc., are only a part of the answer to our vast sickness problems. *Nourishing* food is basic. And "the soil is the source of life"—what happens there is of the utmost importance to us all.

Cloth, illustrated, 5½x8, 400 pages, **$4.00.**

Order from ORGANIC FARMER,
Dept. OF-10P, Emmaus, Pa.

Bee Keeping

Dear Mr. Rodale,

I have just read with great interest your book *The Organic Front* and I agree with practically all you say. On the matter of diet you have some good points to make but I am surprised that you make no mention of honey as a food. Now on this point I have something to say, because it breaks my heart to see what the beekeepers permit the merchandisers to do to the produce they take such pains to secure from the bees. There is a whole reform to be instituted.

I have kept a small apiary going for some ten years now, mostly to get honey for my own use, to pollinate my small orchard, and for the general absorbing interest of seeing the bees at work. At the end of the season, I collect my honey and do my own extracting. And after the honey is extracted from the combs, I first filter it through a double thickness of butter muslin, then run it into the cans. My honey thus treated contains quite a lot of small particles of wax from the uncapping process and also quite a lot of pollen which the bees store in the outermost cells of the extracting combs. Also a small amount of propolis comes off the combs during the extracting. This propolis—or bee glue—is as you probably know a useful disinfectant.

In addition to the extracting combs I have some comb honey, and this we eat first when it is fresh and savory. The extracted honey we allow to granulate for some three months, when the honey, wax, pollen and propolis all combine together and form a wonderful buttery honey with a superb flavour. Naturally we keep the honeys separate, not mixing the white clover honey with the dark buckwheat or the amber golden rod. In fact, the amber honeys should never be eaten before three months maturing and the buckwheat does not reach its real flavour for about six months. It is horrible stuff to eat when newly extracted, I think.

I never have difficulty in disposing of any surplus honey that I have available over and above my own needs, and I send this as far away as Toronto, where it seems that similar honey is unobtainable. Also I have taken honey with me on vacations in the U. S. and shared it with visitors in the hotels where I have stayed. Invariably, these visitors say, "But where do you get such honey. The flavour is perfect." I simply reply that the

J. I. RODALE *says about:*

Make Friends With Your Land

by **LEONARD WICKENDEN**

"It's the most readable book yet written in the field of organic farming and gardening. Written by a practicing consulting chemist, it covers technical ground in a manner surprisingly easy to read and to enjoy. It strikes the final knock-out blow to the concept that chemical fertilizers are in any manner good for crops and soil.

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honey IS honey, unprocessed, unpasteurized, and right from bee to consumer, as straight as that line can be.

Now why this astonishment? Here's why. The professional bee-keepers sell their output to merchandisers, and they want to have a uniform product to put on the shelves of the chain groceries alongside the corn syrup, the molasses, the commercially made jams and jellies. Honey in this way is reduced to a sweetening agent more or less, and the housewife always gets the same "honey" flavour. The honey received from the bee-keeper is "pasteurized." There is no sense to the use of this word as applied to honey, for honey contains no disease germs that need pasteurizing in the proper sense of the word. All pasteurizing means is that the honey is heated to destroy certain ferments and yeasts which cause it to granulate and to ferment if kept in too high a temperature. Ignorant folks say that such honey has turned to sugar and take it back to the store!

This heating is very difficult to do properly, for if the heat goes above a certain figure, the flavour is lost and if carried higher still, the honey breaks down. Now I am positive that this heating destroys a "live" element in the honey, turning it to a dead state in which it will not granulate or ferment. Heating wine has the same effect.

Furthermore, the heating, however mild, does chase off most of the flower essences which give the honey the flavour of the plants and which are extremely volatile. So after the pasteurizing process is carried out by the merchandisers and all the superb, delicate fragrancies of the flowers have gone up the ventilating flues, the merchandiser adds a sweet perfumed imitation flavour called "clover," or anything else you like to call to call it. So quite evidently all honey will taste the same, and when the harassed housewife come home from the store all the kids eye the jar of honey and say, "Oh! that stuff again!"

But that manner of working, judging by what one reads in the Bee Journals, is the bee-keeper's *ideal* way of selling the honey! Get it on the shelves of the chain groceries in standardized packages and get your share of the housewife's dollar in competition with the corn syrup, the maple-type maple syrup, the cane sugar molasses (highly processed) and all the rest of the sweetening agents.

I have tried to stir up some interest in other methods of marketing. For long years I have lived in France, and when in Paris I used to go to the shop kept by the Bee-Keepers Union, a co-operative enterprise. There you would find on the shelves a dozen kinds of honey, all granulated, all pure and all different flavours: clover, heather, mountain flower honey, honey from the south near Grasse where the flowers for the perfumes are grown, honeys from the flowers of sweet herbs, etc., etc. And the same range prevailed in comb honey.

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Of THE ORGANIC FARMER published monthly at Emmaus, Pennsylvania for October, 1949.

State of Pennsylvania
County of Lehigh

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. I. Rodale, who, having been duly sworn according to law, deposes and says that he is the Publisher of THE ORGANIC FARMER and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

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Editor—J. I. Rodale, Allentown, Pa.

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Signed, J. I. RODALE, Publisher

Sworn to and subscribed before me this 12th day of September, 1949.

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